

PROJECT MANUAL

Standby Generator Installation

Cos Cob School

300 E Putnam Avenue

Greenwich, CT 06807

BID #2534-25

June 25, 2025

ISSUED FOR BID

MEP ENGINEER:

LANDMARK FACILITIES GROUP, INC.

252 EAST AVENUE

NORWALK, CT 06855



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GREENWICH PUBLIC SCHOOLS
Purchasing Department
290 Greenwich Avenue
Greenwich, Connecticut 06830
(203) 625-7411
eugene_watts@greenwich.k12.ct.us

EUGENE H. WATTS
Manager of School Procurement

June 25, 2025

Dear Sir/Madam:

You are invited to submit a bid for Standby Generator Installation at Cos Cob School for the Greenwich Public School District. The attached bid specifications detail the requirements we are looking for.

Bidders are urged to read all documents carefully and fill out all information requested. Bids which are incomplete, obscure, or conditional, and which contain irregularities of any kind, will be subject to rejection for failure to comply strictly with these conditions.

Bids must be submitted on the schedule forms attached. All unit prices must be filled in and the cost sheet must be the first page of the submitted bid. Each bid must be submitted and clearly marked with (1) original and six (6) copies of your bid. Faxed emailed or late bids will not be accepted. The original bid and copies must be in a sealed envelope plainly marked with the Vendors name and address and the following information:

Standby Generator Installation at Cos Cob School

Bid Number: 2534-25
Opening Date: 7/22/25
Opening Time: 11:00 a.m.

Mandatory Walk-through

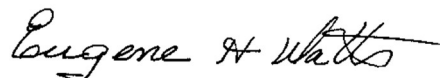
Cos Cob School, 300 East Putnam Ave 06807
July 2, 2025 @ 10:00 a.m.

The meeting for the bid opening will be held remotely by telephone. The details to join the meeting remotely are as follows:

Dial-In by phone: 1 515 518-4287 PIN Number 392 528 966#

All bidders and other interested people are invited to call in to hear Bid #2534-25 being read at 11:00 a.m.

Very truly yours,



Eugene H. Watts

INSTRUCTIONS TO BIDDERS

1.1 The Greenwich Public Schools, Greenwich, CT, invites bid proposals for the following:

A. **Standby Generator Installation at Cos Cob School** for the Greenwich Public Schools.

1.2 BACKGROUND:

A. TOWN / DISTRICT: The Town of Greenwich is approximately 30 miles northeast of New York City and has a population of about 60,000 residents. The Greenwich Public Schools enjoy a national reputation for excellence and have strong support from the community. The fifteen public schools have an enrollment of 9,000 students and consists of eleven elementary schools (K-5), three middle schools (6-8), and one comprehensive high school (9-12).

B. MEP ENGINEER: Landmark Facilities Group, Inc. 252 East Avenue, Norwalk CT 06855

1.3 SCHEDULE:

A. Mandatory Pre-Bid Walk Through:

1. Wednesday, **July 2nd**, 2025 at 10:00 a.m., Cos Cob School (Main Entrance).

B. Bid Due Date:

1. Sealed proposals will be received as indicated below, and at that time and place will be publicly opened and read aloud.

2. Date: **July 22nd, 2025**

3. Time: **11:00 a.m. local time**

4. Location: **Phone Dial In**

5. All bidders and other interested persons are invited to be present at this bid opening(s).

C. QUESTIONS:

1. Questions concerning this bid will be received by email only and directed to:

a. **bid_department@greenwich.k12.ct.us.**

b. In the subject line you must put BID #2534-25, Standby Generator Installation at Cos Cob School.

c. All questions must be submitted no later than 12:00pm, **July 10th**, 2025.

2. All answers will be provided by written BID ADDENDUM at **www.greenwichschools.org** at noon on **July 15th**, 2025. It is the responsibility of all bidders to verify that they are current with all posted information.

3. Failure to comply with these conditions will result in the bidder waiving his right to dispute the bid specifications and conditions.

1.4 BID SUBMISSION / REQUIREMENTS:

A. Bidders are required to order their bid such that the bid form appears on page 1 of the bid package.

B. Each bid shall be signed and accompanied by a bid security payable to the Town of Greenwich in the amount of ten (10%) of the bid and shall be in the form of a Bid Bond only as issued in the bid documents. Bid Bonds must use the Greenwich Public Schools Bid Bond Form (included within the bid documents), issued by a surety company listed on the current U.S. Dept of Treasury's Federal Register and be licensed to underwrite bonds in the State of Connecticut.

C. Each bid shall be accompanied by a completed copy of the CONTRACTOR'S QUALIFICATION STATEMENT included in the bid documents. The Greenwich Public Schools reserves the right to request further information and/or supplemental information with respect to the QUALIFICATION STATEMENT of its sole discretion.

- D. Each bidder shall utilize the specified manufacturers. Should the contractor desire to substitute other articles, materials, apparatus, products, or processes, other than those specified or approved as equal, the contractor shall apply to the engineer, in writing, for approval of such substitution. It should be noted that the bid shall not be based on a substituted article, material, apparatus, product, or process. No substitution review shall take place prior to bid.
- E. Each form of the bid contains a section for alternates and for unit prices. All alternate prices must be completed with a dollar value. Blanks, "Not Applicable" (N/A), "No Effect", etc in these portions of the BID FORM shall be construed to indicate that the particular alternate shall be performed without increase to the contract price as they relate to the scope of the trade package.
- F. Unit prices which do not affect the work of the bidder's trade may be filled in "Not Applicable" or "(N/A)". "Not Applicable" or Blanks in these Bid Forms and shall be construed to indicate that the unit price is not applicable as it relates to the scope of the trade package.
- G. TAX: No amount shall be added for the Connecticut sales tax or Federal tax. The Greenwich Public School system is exempt from the payment of taxes imposed by the Federal government and/or State of Connecticut. Taxes must not be included in the bid price.
- H. PERMIT FEES: Greenwich Public Schools will secure the building permit(s) and upon award of the Contract they will be transferred to the awarded contractor / vendor. No cost should be included in the base bid for the building permit.
- I. WAGES: All work shall be done in accordance with applicable State statutes; conditions of Prevailing Wages shall apply. Prevailing Wage Schedule provided herein is for demonstrable purposes only. It is the responsibility of the bidder / vendor to verify actual rates.
- J. COLLUSION AMONG BIDDERS:
 - 1. More than one offer from an individual, firm, partnership, corporation, or association under the same or different name will be rejected. Reasonable grounds for believing that a bidder is interested in more than one bid for the work contemplated will cause rejection of all bids in which the bidder is interested. Any or all bidders will be rejected if there is any reason for believing that collusion exists among the bidders.
 - 2. Participants in such collusion may not be considered in future offers for the same work. Each bidder, by submitting a bid, certifies that it is not party to any collusive action.
 - 3. Each bid shall be accompanied by a completely filled in and properly executed **Non-Collusive Affidavit**, provided on pages 18-20.
- K. EMPLOYMENT DISCRIMINATION BY CONTRACTOR PROHIBITED:
 - 1. The successful bidder will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin, except where religion, sex, or national origin is a bona-fide occupational qualification reasonably necessary to the normal operation of the contractor.
 - 2. The successful bidder agrees to post in a conspicuous place, available to employees and applicants for employment, notices setting forth the provision of this nondiscrimination clause.
 - 3. The successful bidder in all solicitations or advertisements for employment, placed by or on behalf of the contractor, will state that such successful bidder is an EQUAL OPPORTUNITY EMPLOYER.

- L. QUALIFICATIONS: No qualifications to the bid are allowed. If bids are qualified, they may be deemed non-responsive and subsequently rejected.
- M. No Bidder may withdraw their Bid within 90 days after the actual date of Bid Opening
- N. COPIES: Failure to submit a bid with four copies does not constitute a material defect.
- O. BID EVALUATION: A committee composed of various administrators will evaluate bids. The following criteria guidelines will be used in analyzing and evaluating this bid:
 - 1. Conformance to the requirements of this bid, i.e. conformance to Terms, Conditions, and Scope of Work.
 - 2. Proven skills and technical competence.
 - 3. Background of the firm.
 - 4. For Vendor firm, identification of all personnel who will have a principal responsibility.
 - 5. The Board of Education may consider proximity of the vendor's service as a factor in determining lowest responsible bid. Companies must be located within 100 miles of the School District in order to submit a bid.
 - 6. The Board of Education shall have the right to take such steps as it deems necessary to determine the ability of the bidder to perform the work and the bidder shall furnish the Board of Education with information and data for this purpose as the Board of Education may request. The right is reserved to reject any bid where, on investigation, the evidence or information submitted by such bidders does not satisfy the Board of Education that the bidder is qualified to carry out properly the terms of the Contract.
 - 7. Apparent low bidder agrees to submit the following Supplements to Greenwich Public Schools within 48 hours after submission of the Bid for consideration in award of the Contract:
 - a. Subcontractors; Include the names of all Subcontractors and the portions of the Work they will perform.
 - b. Cost Breakdown identifying the Bid Price/Sum segmented into portions as requested, broken down per school building. (Schedule of Values)
- P. AWARD: The Contract shall be awarded to the lowest responsible and qualified bidder, meaning the bidder whose bid is the lowest of those bidders possessing the skill, ability, and integrity necessary to faithfully perform the work based on objective criteria considering past performance and financial responsibility. In considering past performance, the Greenwich Public Schools shall evaluate the skill, ability, and integrity of bidders in terms of the bidders' fulfillment of contract obligations and all the bidders' experience or lack of experience with projects of similar size and scope. The Greenwich Public Schools reserves the right to consider as unqualified to do the work required by the bid documents any bidder that does not habitually perform with its own forces the major portion of the work involved in the bid documents. No contract will be awarded to any bidder who is at time of award not qualified under applicable regulations issued by the Secretary of Labor, United States of Department of Labor, or any applicable State and local laws and regulations.
- Q. REJECTION: after review of all sectors, terms, and conditions, including price, Greenwich Public Schools reserves the right to reject any and all bids, or any part thereof, or waive defects in same.
- R. Any bid may be withdrawn prior to the opening time and date. Any bids received after the

specified time and date will not be considered.

1.5 BIDDER QUALIFICATIONS:

- A. The Department of Administrative Services (DAS) Construction Contractor Prequalification Program ([C.G.S. 4a-100](#)) requires all contractors to prequalify before they can bid on a contract or perform work pursuant to a contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or any other public work by the state or a municipality, estimated to cost more than \$500,000 and which is funded in whole or in part with state funds, except a public highway or bridge project or any other construction project administered by the Department of Transportation.
- B. Companies must be located within 100 miles of the School District in order to submit a bid.
- C. Companies submitting a bid must be in business under the same corporate name for a minimum of five (5) years.
- D. Non-Connecticut Contractors: Pursuant to Connecticut General Statutes §12-430(7), as amended by Public Act No. 11-61, Section 66, a non-resident contractor shall comply with the State of Connecticut's bonding requirements.

1.6 CONTRACT:

- A. SINGLE PRIME CONTRACT will be let for:
 - 1. General Construction
 - 2. Bid awards must be approved by the Greenwich Public Schools. All contractors shall be required to execute the Greenwich Public Schools standard form of Contract and accompanying Payment & Performance Bonds without exception.
- B. LENGTH: This bid is for awarding the contract to cover the period beginning August 08, 2025. Once this Bid is awarded, successful bidder must make arrangements to meet with Greenwich Public Schools as required.
- C. SUBSTANTIAL COMPLETION: Contractor shall complete all work within the building and on the project site such that the property and building are occupiable by the owner for all purposes, contractor shall complete all system testing and testing record documentation, and all systems shall be inspected and approved by the authority having jurisdiction on or before **August 21st, 2026**.
- D. FINAL COMPLETION: Contractor shall complete all work associated with the project including but not limited to incomplete items identified on the punch list, closeout documentation, project record documents, operation and maintenance manuals on or before **December 31st, 2026**.
- E. OPTION TO EXTEND: All work associated with the project shall be completed on or before December 31st, 2026. The Board of Education may, at their option and with the approval of the vendor, extend the period of the Contract to June 30th, 2027. If the Board of Education intends to extend the contract period, the vendor shall be notified in writing by the purchasing department at least fourteen (14) calendar days prior to the expiration of the original contract.
- F. AWARD OF CONTRACT: The contract will be awarded by the Board of Education to a qualified firm or person at compensation determined to be fair and reasonable considering budgetary limitations, scope, complexity, and the nature of goods and/or services.
 - 1. If there is a conflict between the Contract Agreement and the General Conditions, the Contract Agreement shall prevail.

2. The successful bidder will produce for the Greenwich Public Schools review a current financial statement, which will remain strictly confidential.
- G. The contractor shall simultaneously with the signing of the Contract, furnish the Town the executed Performance, Maintenance, and Payment Bond of a surety company authorized to do business in the State of Connecticut, and acceptable to the Town, in the sum of all the full amount of the Contract Obligation in the form provided by the town. The Performance Bond will not be required where the total estimated cost of labor and materials under the contract with respect to which such general bid is submitted is less than one hundred thousand dollars (\$100,000). Once a contract exceeds \$100,000 the bidder will be responsible for obtaining and paying for all bonds required by Greenwich Public Schools.
- H. FEE PAYMENTS: The Greenwich Public Schools reserves the right to provide payment in accordance with completion of services based on the Project Schedule.
- I. BACKGROUND CHECK: The bidder is required to do Employee Background Checks as imposed by Conn. Gen. Stat. 10-221d and 10-222c.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PROVISIONS:

- A. Consumption or use of alcohol and / or drugs is prohibited on school property. Any individual with alcohol or drugs will be removed from said property and will not be allowed to work on the project. Smoking is prohibited in all school buildings and on school grounds.
- B. Greenwich Public Schools reserves the right to reject any proposed subcontractor for reasonable cause.

BID FORM

The undersigned hereby proposes to furnish all labor, materials, devices, appliances, supplies, equipment, services, and other facilities necessary to complete all of the work of the above referenced Contract, as required by, and in accordance with, the provisions of the Instructions to Bidders, the Conditions of the Contract, the Drawings and Specifications, all as prepared by Landmark Facilities Group, Inc. dated June 25th, 2025; and that, if this Proposal is accepted, the Undersigned agrees to enter into an Agreement with the Owner to perform this work for the sum(s) as follows:

SUBMITTED BY: _____

Bidder's Full Name (please print) _____

Bidder's Primary Email Address _____

Address _____

City,

State,

Zip

1.1 BASE BID VALUE:

- A. **BASE BID:** The Base Bid Proposal for all work required by the Contract Document for the Standby Generator Installation Project at **Cos Cob School** and Related Work is as follows:

_____ (\$ _____) DOLLARS

1.2 ALTERNATE VALUES:

1. N/A

1.3 ACCEPTANCE:

- A. If this bid is accepted by Greenwich Public Schools within the time period stated above, we will:
1. Execute the Agreement within seven days of receipt of Notice of Award.
 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- B. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Greenwich Public Schools 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.

1.4 CONTRACT TIME:

- A. The Undersigned agrees in the Base Bid to complete the work as per the Milestone Schedule provided in the Specifications.

1.5 ADDENDA:

- A. The following Addenda have been received. The modifications to the Bid Document noted below

have been considered and all cost are included in the Bid Sum.

1. Addendum#_____ Date_____.
2. Addendum#_____ Date_____.
3. Addendum#_____ Date_____.
4. Addendum#_____ Date_____.
5. Addendum#_____ Date_____.

1.6 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 hereinabove names has any interest in this bid or in the contract proposed to be entered into.
 2. That said bidder is not in arrears to the Greenwich Public School upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the Greenwich Public Schools.
 3. That no member of the Greenwich Public Schools or any officer or employee of the Greenwich Public Schools or person whose salary is payable in whole or in part from the 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.
 4. 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 material, 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
 5. 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.

BID FORM SIGNATURE(S)

Signature

Corporate Seal

Company Name:_____

was hereunto affixed in the presence of:

Subscribed and sworn before me this day of _____ 2025

Notary Public:_____

My Commission Expires:_____

CONTRACTOR'S QUALIFICATION STATEMENT

With the submittal of the Bid Proposal Form (Section 00 0400), the bidder shall attach this Contractor's Qualification Statement and shall answer the Questions herein. Failure to answer these questions in full may be cause for rejection of the bidder's proposal. **If more space is needed, please attach other sheets with reference to subject paragraph.**

The Board of Education reserves the right to consider, but not limited to, the financial responsibility, experience and reputation in the construction industry, as well as the specific qualifications listed below and elsewhere in this document in considering bids and awarding the contract. The Board of Education reserves the right to waive any informalities if, at its discretion the interest of the Greenwich Public Schools will be better served.

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO: Greenwich Public Schools

ADDRESS: 290 Greenwich Avenue, Greenwich, CT 06830

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

NAME OF PROJECT: Standby Generator Installation at Cos Cob School

TYPE OF WORK (file separate for each Classification of Work)

- ☐ General Construction
- ☐ HVAC
- ☐ Plumbing
- ☐ Electrical
- ☐ Fire Alarm
- ☐ Other _____

1.1 ORGANIZATION

- A. How many years has your organization been in business as a Contractor?
- B. How many years has your organization been in business under its present business name?
 - 1. Under what other or former names has your organization operated?
- C. What is the firm's bonding range?
 - 1. Single
 - 2. Aggregate
- D. If your organization is a corporation, answer the following:
 - 1. Date of Incorporation:
 - 2. State of Incorporation:
 - 3. President's name:
 - 4. Vice-president's name(s):
 - 5. Secretary's name:
 - 6. Treasurer's name:

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- E. If your organization is a partnership, answer the following:
1. Date of organization:
 2. Type of partnership (if applicable):
 3. Name(s) of general partner(s):
- F. If your organization is individually owned, answer the following:
1. Date of organization:
 2. Name of owner:
- G. If the form of your organization is other than those listed above, describe it and name the principals.

1.2 OWNERSHIP, MANAGEMENT, AFFILIATION

- A. Identify each person who is or has been within the past five years, an owner of 5.0% or more of the firm's shares, one of the five largest shareholders, a director, an officer, a partner or the proprietor, or a managerial employee.

First Name	MI	Last Name	DOB	% Owned	Director Y or N	Officer Y or N	Title	Partner Y or N

- B. Joint Ventures: Provide information for all firms involved. Fill in name, % owned, office held; indicate by Y or N whether director, officer, partner and title.

First Name	MI	Last Name	DOB	% Owned	Director Y or N	Officer Y or N	Title	Partner Y or N

- C. Identify any other firms in which now or in the past five years, the firm or any of the individuals listed in questions 1.2.A and 1.2.B above, either owned or owns 5.0% or more of the shares of or was or is one of the five largest shareholders, a director, an officer, a partner or a proprietor of said other firm. ☐ Yes, list below ☐ No
- D. Has the firm or any firm listed in response to questions above defaulted or been terminated and its surety called upon to complete, any contract awarded within the past five years ☐ Yes ☐ No. If yes, give date(s), agency(ies)/owner(s), project(s), contract numbers, and describe including the result:
- E. List below any projects performed by the bidder in the past five (5) years on which any of the following events occurred:
1. Were any extension of time requested by the contractor, and were such requests granted?
 2. Was litigation and/or arbitration commenced by either the Owner or the bidder as a result of the work of the project performed by the bidder?
 3. Were any liens filed on the project by subcontractors or material suppliers of the bidder?
 4. Did the bidder make any claims for extra work on the project, and did said claim result in a change order?

Project	Type of Event	Name/Address of Owner	Name & Phone # of Contact Person at Owner

- F. For all contracts within the past five years: (a) List all liens or claims over \$25,000 filed against the firm and remaining undischarged or unsatisfied for more than 90 days; and (b) list and describe all liquidated damages assessed.

Federal ID No.	% Owned	Firm/Company Name: Position	Company Address

1.3 FINANCIAL INFORMATION

- A. Greenwich Public Schools reserves the right to obtain the firm's most recent annual financial statement upon request.

1.4 OTHER INFORMATION

- A. Within the past five years has the firm, any affiliate, any predecessor company or entity or any person identified in questions number 1.1 through 1.2 above been the subject of any of the following: (Respond to each question and describe in detail the circumstances of each affirmative answer: (Attach additional pages if necessary).

1. A judgment of conviction for any business-related conduct constituting a crime under state or federal law. No ☐ Yes ☐
2. A criminal investigation or indictment for any business-related conduct constituting a crime under state or federal law? No ☐ Yes ☐
3. An order of protection filed against an officer or employee prohibiting access to jobsite(s) or prohibiting contact with any staff of any owner? No ☐ Yes ☐
4. A grant of immunity for any business-related conduct constituting a crime under state and federal law? No ☐ Yes ☐
5. A federal or state suspension or debarment? No ☐ Yes ☐
6. A rejection of any bid for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid? No ☐ Yes ☐
7. A rejection of any proposed subcontract for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid? No ☐ Yes ☐
8. A denial or revocation of prequalification? No ☐ Yes ☐
9. A voluntary exclusion from bidding/contracting agreement? No ☐ Yes ☐
10. Any administrative proceeding or civil action seeking specific performance or restitution in connection with any public works contract except any disputed work proceeding? No ☐ Yes ☐
11. An OSHA Citation and Notification of Penalty containing a violation classified as serious? No ☐ Yes ☐
12. An OSHA Citation or Notification of Penalty containing a violation classified as willful? No ☐ Yes ☐
13. A prevailing wage or supplement payment violation? No ☐ Yes ☐
14. A State Labor Law violation deemed willful? No ☐ Yes ☐
15. Any other federal or state Citations, Notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation? No ☐ Yes ☐
16. Any criminal investigation, felony indictment or conviction concerning formation of or any business association with, an allegedly false or fraudulent women's, minority or disadvantaged business enterprise? No ☐ Yes ☐
17. Any denial, decertification, revocation or forfeiture of Women's Business Enterprise, Minority Business Enterprise or Disadvantaged Business Enterprise status? No ☐ Yes ☐
18. Rejection of a low bid on a State contract for failure to meet statutory affirmative action M/WBE requirements? No ☐ Yes ☐
19. A consent order with the NYS Department of Environmental Conservation or a federal, state or local government enforcement determination involving a violation of federal or ☐ ☐

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state environmental laws?	No	Yes	
20. Any bankruptcy proceeding?	No	☐ Yes	☐
21. Any suspension or revocation of any business or professional license?	No	☐ Yes	☐
22. Any citations, notices, violation orders, pending administrative hearings or proceedings or determinations for violation of:			
Federal, state or local health laws, rules or regulations?	No	☐ Yes	☐
Federal, state or local environmental laws, rules and regulations?	No	☐ Yes	☐
Unemployment insurance or workers compensation coverage or claim requirements?	No	☐ Yes	☐
ERISA (Employee Retirement Income Security Act)?	No	☐ Yes	☐
Federal, state or local human rights laws?	No	☐ Yes	☐
Federal or state security laws?	No	☐ Yes	☐
23. Withdrawal or an agreement to withdraw a bid submitted to a public owner or a request by a public owner to withdraw a bid?	No	☐ Yes	☐
24. During the five year period preceding the submission of this bid, has the bidder been named as a part in any lawsuit in an action involving a claim for personal injury or wrongful death arising from the performance of work related to any project in which it has been engaged? If the answer to the question is yes, list all such lawsuits, the index number associated with said lawsuit and the status of the lawsuit at the time of the submission of this bid.	No	☐ Yes	☐
25. During the five year period preceding the submission of this bid, has the bidder been the subject of proceedings before the Department of Labor for alleged violations of the Labor Law as it related to the payment of prevailing wages and/or supplemental payment requirements? If the answer to the question is yes, 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.	No	☐ Yes	☐
26. During the five year period preceding the submission of this bid, has the bidder been the subject of proceedings involving allegations that it violated the Worker's 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 the question is yes, list such instance of violation and the status of the claimed violation at the time of disposition of this bid.	No	☐ Yes	☐
27. Has the bidder, its officers, directors, owner and/or managerial employees been convicted of a crime or been the subject of a criminal indictment during the five years preceding the submission of this bid? If the answer to the 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.	No	☐ Yes	☐
28. During the five year period preceding the submission of this bid, 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 the 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.	No	☐ Yes	☐
29. Has the bidder ever defaulted or had its surety called upon to complete any contract awarded within the past five years? If the answer to the question is yes, list the projects, the dates and the nature of the termination (convenience, suspension, for cause).	No	☐ Yes	☐
30. Has any officer or partner of the bidder's organization ever defaulted or had its surety called upon to complete any contract awarded within the past five years or been an officer or partner of some other organization that has been terminated from a project by an owner? If yes, state:	No	☐ Yes	☐

Standby Generator Installation at Cos Cob School

Name of Individual	Name of Organization	Reason(s)

B. LICENSING

1. List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration of license numbers, if applicable.
2. List jurisdictions in which your organization's partnership or trade name is filed:
3. Has any director, officer, owner or managerial employee had any professional license suspended or revoked? If the answer is yes, list the name of the individual, the professional license he/she formally had, whether the license was revoked or suspended and the date of the revocation or suspension; No ☐ Yes ☐

1.5 EXPERIENCE

- A. List the categories of work that your organization will perform with its own forces:
- B. Claims and Suits. (If the answer of any of the questions below is yes, please attach details.)
 - a. Have you or has any director, officer, owner or managerial employee ever failed to complete any work awarded to them? If yes, list the project(s) the date(s) and the reason(s) for the failure to complete. No ☐ Yes ☐
 - b. Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers? No ☐ Yes ☐
 - c. Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years? No ☐ Yes ☐
 - d. Within the past five years, has any officer or principal of your organization ever been an officer or a principal of another organization when it failed to complete a construction contract? If the answer is yes, please attach details. No ☐ Yes ☐
- C. On a separate sheet, list **all** similar construction projects your organization has in progress or completed, giving the name of project, owner, engineer, contract amount, percent complete and scheduled completion date.
 1. State total worth of work in progress and under contract:
- D. On a separate sheet, list **all** projects, not listed above, that your organization has completed or in progress in the past five years, giving the name of the project, owner, engineer, contract amount, date of completion and percentage of the cost of the work performed with your own forces.
 1. State average annual amount of construction work performed during the past five years:
- E. On a separate sheet, list the construction experience and present commitment of the key individuals of your organization.

1.6 REFERENCES

- A. Trade reference:
- B. Bank references:
- C. Surety:
 1. Name of present bonding company:
 2. Name and address of agent:
 3. Name or previous bonding company:

1.7 CERTIFICATION

- A. The undersigned recognizes that this questionnaire is submitted for the purpose of the Greenwich Public Schools (Owner) to award a contract or approve a subcontract; acknowledges that the Owner may in its discretion, by means which it may choose, determine the truth and accuracy of all statements made herein; acknowledge that intentional submission of false or misleading information may constitute a felony, or a misdemeanor, and may also be punishable by a fine or imprisonment; and states that the information submitted
- B. in this questionnaire and any attached pages is true, accurate and complete.
Dated at this day of _____

Name of Organization:

By:

Title:

SWORN AND SUBSCRIBED TO BEFORE ME, A NOTARY PUBLIC, IN AND FOR

THE COUNTY OF _____ AND THE STATE OF _____

THIS _____ DAY OF _____, 2025

NOTARY PUBLIC

MY COMMISSION EXPIRES _____

GREENWICH PUBLIC SCHOOLS

BID #2534-25 DEADLINE: July 22nd AT 11:00 a.m.

Standby Generator Installation at Cos Cob School

REPLY SHEET (Page 1 of 3)

STATEMENT OF NON-COLLUSION

In submitting this bid/proposal, the undersigned declares that this is made without any connection with any persons making another bid/proposal on the same contract; that the bid/proposal is in all respects fair and without collusion, fraud, or mental reservation; and that no elected or appointed official of the Town, or any person or entity in the employ of the Town, is directly or indirectly interested in said bid/proposal or in the supplies or work to which it relates, or in any portion of the profits thereof, except as permitted under the Town of Greenwich Code of Ethics.

CODE OF ETHICS

In submitting this bid, the undersigned further declares and certifies that a) it has not, and will not induce or attempt to induce any Town of Greenwich employee or officer to violate the Town of Greenwich Code of Ethics in connection with its offer to provide goods or services under, or otherwise in the performance of, such contract, and b) if an elected or appointed official or any person in the employ of the Town has a direct or indirect interest in Vendor or any supplier or Subcontractor expected to be involved with the contract, such person or entity is in compliance with the safe harbor procedures established by the Town of Greenwich Board of Ethics or has received an advisory from the Town's Board of Ethics with respect to such involvement.

The undersigned further understands that the above declarations are material representations to the Town of Greenwich made as a condition to the acceptance of the bid/proposal. If found to be false, the Town of Greenwich retains the right to reject said bid/proposal and rescind any resulting contract and/or purchase order and notify the undersigned accordingly, thereby declaring as void said bid/proposal and contract or purchase order.

The Town of Greenwich Code of Ethics can be found at www.greenwichct.gov. Relevant provisions of the Town's Code of Ethics state:

Section 2. DEFINITIONS. (1) Indirect interest, without limiting its generality, shall mean and include the interest of any subcontractor in any prime contract with the Town and the interest of any person or his immediate family in any corporation, firm, or partnership which has a direct or indirect interest in any transaction with the Town. (2) Substantial financial interest shall mean any financial interest, direct or indirect, which is more than nominal, and which is not common to the interest of other citizens of the Town. (3) Town officer shall mean and include any official, employee, agent, consultant, or member, elected or appointed, of any board, department, commission, committee, legislative body, or other agency of the Town. (4) Transaction shall mean and include the offer, sale, or furnishing of any real or personal property, material, supplies, or services by any person, directly or indirectly, as Vendor, prime contractor, subcontractor, or otherwise, for the use and benefit of the Town for a valuable consideration, excepting the services of any person as a Town officer.

Section 3. GIFTS AND FAVORS. No Town officer or his immediate family shall accept any valuable gift, thing, favor, loan, or promise that might influence the performance or nonperformance of his official duties.

Section 4. IMPROPER INFLUENCE. No Town officer having a substantial financial interest in any transaction with the Town or in any action to be taken by the Town shall use his office to exert his influence or to vote on such transaction or action.

GREENWICH PUBLIC SCHOOLS

BID #2534-25 DEADLINE: July 22nd AT 11:00 a.m.

Standby Generator Installation at Cos Cob School

REPLY SHEET (Page 2 of 3)

By signing below, the undersigned acknowledges reviewing and understanding the Non-Collusion and Code of Ethics statements contained herein and confirms compliance with the contents:

AUTHORIZED SIGNATURE: _____

PRINT NAME: _____

BIDDER'S COMPANY NAME: _____

GREENWICH PUBLIC SCHOOLS

BID #2534-25 DEADLINE: July 22nd AT 11:00 a.m.

Standby Generator Installation at Cos Cob School

REPLY SHEET (Page 3 of 3)

BIDDER INFORMATION:

BIDDER'S COMPANY NAME _____

ADDRESS _____

TELEPHONE # _____ **FAX #** _____

E-MAIL ADDRESS _____

WEB SITE _____

AUTHORIZED SIGNATURE _____

PRINT NAME _____

TITLE _____

STATE OF CT TAXPAYER ID # _____

FEDERAL TAXPAYER ID # _____

INCORPORATED IN THE STATE OF _____ **Corporate Seal** ☐ Yes ☐ No

AWARD/CONTRACT SIGNATURE

The Bidder shall indicate below, the full name, title, and the complete mailing address of the authorized person (i.e., **officer of the company**) who will sign the contract (if applicable) for this procurement:

Minimum Rates and Classifications
for Building Construction

ID#: 25-6473

Connecticut Department of Labor
Wage and Workplace Standards Division

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: Project Town: Greenwich
State#: FAP#:
Project: Cos Cob School: Generator Installation

CLASSIFICATION	Hourly Rate	Benefits
1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters.**See Laborers Group 7**		
1c) Asbestos Worker/Heat and Frost Insulator	48.81	34.05
2) Boilermaker	48.21	30.01
3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons	42.61	35.92 + a
3b) Tile Setter	40.0	32.75
3c) Tile and Stone Finishers	33.0	27.43
3d) Marble & Terrazzo Finishers	34.2	26.23
3e) Plasterer	44.52	29.63

3f) Terrazzo Mechanics & Marble Setters	40.6	34.93
-----LABORERS-----		
4) Group 1: General laborers, carpenter tenders, concrete specialists, wrecking laborers and fire watchers.	35.7	28.85
4) Group 1a: Acetylene Burners (Hours worked with a torch)	36.7	28.85
4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofers/mixer/nozzleman (Person running mixer and spraying fireproof only).	35.95	28.85
4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry).	36.2	28.85
4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew who primary task is to actually perform the mating of pipe sections) P6 and P7 rate is \$26.80.	36.7	28.85
4d) Group 5: Air track operator, sand blaster and hydraulic drills.	36.45	28.85
4e) Group 6: Blasters, nuclear and toxic waste removal.	38.7	28.85
4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped).	38.7	28.85
4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew.	36.2	28.85

4h) Group 9: Top men on open air caisson, cylindrical work and boring crew.	35.7	28.85
4i) Group 10: Traffic Control Signalman	21.42	28.85
4j) Group 11: Toxic Waste Removers A or B With PPE	38.7	28.85
5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers.	42.03	29.19
5a) Millwrights	43.25	29.13
5b) Carpenter - Welder	42.53	29.19
5c) Carpenter: Working with creosote lumber or acid	43.03	29.19
6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	45.0	43.617
7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	66.72	38.435+a+b
-----OUTSIDE LINE CONSTRUCTION-----		
Groundman	30.87	13.91
Linemen/Cable Splicer	56.12	32.85
8) Glazier (Trade License required: FG-1,2)	43.13	26.50+ a

9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	45.25	43.62 + a
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----OPERATORS----

Group 1: Crane Handling or Erecting Structural Steel or Stone; Hoisting Engineer (2 drums or over). (Trade License Required)	58.19	29.80 + a
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Group 1a: Front End Loader (7 cubic yards or over); Work Boat 26 ft. and Over	53.33	29.80 + a
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Group 2: Cranes (100 ton rate capacity and over); Bauer Drill/Caisson. (Trade License Required)	57.78	29.80 + a
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Group 2a: Cranes (under 100 ton rated capacity).	56.79	29.80 + a
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Group 2b: Excavator over 2 cubic yards; Pile Driver (\$3.00 premium when operator controls hammer)	52.92	29.80 + a
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Group 3: Excavator; Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Finegrade. (slopes, shaping, laser or GPS, etc.). (Trade License Required)	51.92	29.80 + a
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Group 4: Trenching Machines; Lighter Derrick; CMI Machine or Similar; Koehring Loader (Skooper); Goldhofer.	51.42	29.80 + a
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Group 5: Specialty Railroad Equipment; Asphalt Spreader, Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24 mandrel).	50.63	29.80 + a
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Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	50.63	29.80 + a
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Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	50.22	29.80 + a
Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under mandrel).	49.77	29.80 + a
Group 8: Mechanic; Grease Truck Operator; Hydroblaster; Barrier Mover; Power Stone Spreader; Welding; Work Boat Under 26 ft.; Transfer Machine; Rigger Foreman.	49.25	29.80 + a
Group 9: Front End Loader (under 3 cubic yards); Skid Steer Loader regardless of attachments; (Bobcat or Similar); Forklift, Power Chipper; Landscape Equipment (including Hydroseeder); Vacuum Excavation Truck and Hydrovac Excavation Truck (27 HG pressure or greater).	48.67	29.80 + a
Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.	45.96	29.80 + a
Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.	45.96	29.80 + a
Group 12: Wellpoint Operator.	45.87	29.80 + a
Group 13: Compressor Battery Operator.	45.12	29.80 + a
Group 14: Elevator Operator; Tow Motor Operator (solid tire no rough terrain).	43.6	29.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	43.06	29.80 + a
Group 16: Maintenance Engineer.	42.2	29.80 + a

Group 17: Portable Asphalt Plant Operator; Portable Crusher Plant Operator; Portable Concrete Plant Operator; Portable Grout Plant Operator; Portable Water Filtration Plant Operator.	47.91	29.80 + a
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Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (Minimum for any job requiring a CDL license); Rigger; Signalman.	44.7	29.80 + a
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Surveyor: Chief of Party	48.16	29.80 + a
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Surveyor: Assistant Chief of Party	44.41	29.80 + a
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Surveyor: Instrument Man	42.73	29.80 + a
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Surveyor: Rodman or Chainman	36.78	29.80 + a
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-----PAINTERS (Including Drywall Finishing)-----

10a) Brush and Roller	39.57	26.50
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10b) Taping Only/Drywall Finishing	40.32	26.50
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10c) Paperhanger and Red Label	40.07	26.50
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10d) Spray	42.57	26.50
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10e) Spray Helper	40.57	26.50
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10f) Blast	44.57	26.50
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10g) Blast Helper	40.57	26.50
11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	50.58	36.30
12) Well Digger, Pile Testing Machine	37.26	24.05 + a
Roofer: Cole Tar Pitch	46.0	24.74 + a
Roofer: Slate, Tile, Composition, Shingles, Singly Ply and Damp/Waterproofing	44.5	24.74 + a
15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	53.22	46.19
16) Pipefitter (Including HVAC work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 & G-9)	50.58	36.30
-----TRUCK DRIVERS-----		
17) Block Truck	37.48	32.68 + a
17a) 2 Axle	36.16	32.68 + a
17ab) Helpers	34.66	32.68 + a
17b) 3 Axle, 2 Axle Ready Mix	36.27	32.68 + a

17c) 3 Axle Ready Mix	36.33	32.68 + a
17d) 4 Axle	36.39	32.68 + a
17e) 4 Axle Ready Mix	37.19	32.68 + a
17ef) 5 Axle	36.39	32.68 + a
17eg) 5 Axle Mixer	37.19	32.68 + a
17f) Heavy Duty Trailer (40 Tons and Over)	38.66	32.68 + a
17g) Euclids and Semi-Trailer	36.44	32.68 + a
17h) Heavy Duty Trailer up to 40 tons	37.39	32.68 + a
17i) Snorkle Truck	36.54	32.68 + a
17j) Swivel Dump and Tack Truck	36.39	32.68 + a
18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	53.76	33.44 + a
19) Theatrical Stage Journeyman	25.76	7.34

Welders: Rate for craft to which welding is incidental.

Surveyors: Hazardous material removal: \$3.00 per hour premium.

*Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.

**Note: Hazardous waste premium \$3.00 per hour over classified rate

Crane with 150 ft. boom (including jib) - \$1.50 extra
Crane with 200 ft. boom (including jib) - \$2.50 extra
Crane with 250 ft. boom (including jib) - \$5.00 extra
Crane with 300 ft. boom (including jib) - \$7.00 extra
Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page:

www.ct.gov/dol. For those without internet access, please contact the division listed below.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

REFERENCES

List at least five (5) references for similar projects in size, scope, and complexity, within Connecticut and/or New York.

THIS PAGE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID.

1) Client _____

Project Address _____

Approximate \$ Value _____ Date: Started _____ Completed _____

Contact: Name _____ Telephone # _____

2) Client _____

Project Address _____

Approximate \$ Value _____ Date: Started _____ Completed _____

Contact: Name _____ Telephone # _____

3) Client _____

Project Address _____

Approximate \$ Value _____ Date: Started _____ Completed _____

Contact: Name _____ Telephone # _____

4) Client _____

Project Address _____

Approximate \$ Value _____ Date: Started _____ Completed _____

Contact: Name _____ Telephone # _____

5) Client _____

Project Address _____

Approximate \$ Value _____ Date: Started _____ Completed _____

Contact: Name _____ Telephone # _____

FORM OF BID BOND

TOWN OF GREENWICH, CONNECTICUT
BID BOND

Date Bond Executed

Principal

Surety

Penal Sum of Bond (express in words and figures)

Date of Bid

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the Town of Greenwich, Connecticut, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents, THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal has submitted the accompanying bid, dated as shown above for _____.
(name of bid)

NOW THEREFORE, if the principal shall not withdraw said bid within the period specified therein after the opening of the same, or if no period be specified, within sixty (60) days after said opening, and shall within the period specified therefor, or if no period specified, within ten (10) days after the prescribed forms are presented to him for signature, execute such further contractual documents, if any, as may be required by the term of the Bid as accepted, and give bonds with good and sufficient surety or sureties as may be required, for the faithful performance and proper fulfillment of the resulting contract, and for the protection of all person supplying labor and material in the prosecution of the work provided for in such contract or in the event of the withdrawal of said bid within the period specified, or the failure to enter into such contract and give such bonds within the time specified, if the principal shall pay the Town of Greenwich, Connecticut, the difference between the amount specified in said bid and the amount for which said Town may procure the required work, supplies, and services, if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF the above bounden parties have executed this instrument under their several seals on the date indicated above. The name and corporate seal (if applicable) of each corporate party being hereto affixed:

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the
_____ of the corporation named as principal in the within bond;
that _____, who signed said bond on behalf of the principal, was
then _____ of the corporation; that I know his signature, and his signature
thereto is genuine; and that said bond was duly signed, sealed and attested for and in behalf of
said corporation by authority of its governing body.

(Corporate Seal)

PERFORMANCE, MAINTENANCE AND PAYMENT BOND

BOND NO. _____ **CONTRACT NO.** _____

KNOW ALL MEN BY THESE PRESENTS. That we _____

_____, as Principal, and _____

a corporation organized under the laws of the State of _____ and authorized to do business in the State of Connecticut as Surety, for holden and firmly bound jointly and severally unto the Town of Greenwich, Connecticut, herein referred to as the Town, the territorial corporation located in the County of Fairfield, in the penal sum of

_____ Dollars (\$ _____),

to be paid to it or its certain attorney, successors or assigns, to which payment well and truly to be made, we the said Obligors do bind ourselves, and each of us, our heirs, executors, administrators, and successors firmly by these presents.

IN WITNESS WHEREOF we have hereunto set for cause to be set our respective hands, names and seals this

_____ day of _____, 20__

The condition of this obligation is such, that whereas the above named Principal has entered into a certain written contract with the Town of Greenwich, Connecticut, dated the

_____ day of _____, 20__

NOW, THEREFORE, if the said Principal shall well and faithfully perform said contract according to its provisions, and fully indemnify and save harmless the Town from all costs and damages which the Town may suffer by reason of failure so to do, and shall pay for all equipment, appurtenances, materials and labor furnished, used or employed in the execution of said contract, and shall indemnify and save harmless the Town from all suits or claims of any nature or description against the Town by reason of any injuries or damages sustained by any person or persons on account of any act or omission of said Principal, his servants or agents, or his subcontractors in the construction of the work or in guarding the work, or on account of the use of faulty or improper materials, or by reason of claims under the Workmen's Compensation Laws or other laws by any employee of the Principal or his subcontractors, or by reason of the use of patented material, machinery, device, equipment, process, method of construction or design in any way involved in the work, and shall indemnify the Town against such defective workmanship, material and equipment as may be discovered within one (1) year after completion and final acceptance of the work, and shall make good in such defective workmanship and material as may be discovered within said period of one (1) year, then the obligation shall be void, otherwise to remain in full force and effect.

The Surety hereby stipulates and agrees that any modifications, omissions or additions in or to the terms of the aforesaid contract, or in or to the plans or specifications therefor, or any extension of time, shall in no wise affect the obligation of the Surety under this bond, the surety hereby waiving any and all right to any notice of any such modifications, omissions, changes, additions or extensions.

Contractor Name: _____ By: _____

Surety Name: _____ By: _____

INSURANCE PROCEDURE

PLEASE NOTE:

THIS PAGE MUST BE RETURNED WITH YOUR BID/RFP. FAILURE TO DO SO MAY RESULT IN YOUR BID/RFP BEING REJECTED.

Please take the insurance requirements of the Contract to your agent/broker immediately upon receipt of the bid documents to determine your existing coverage and any costs for new or additional coverage required for the work noted in this Request for BID/RFP. Any BID/RFP with deficient insurance requirements will be rejected.

STATEMENT OF VENDOR:

I have read the insurance requirements for this work and have taken the documentation to my insurance agent/broker. The BID/RFP cost reflects any additional costs relating to insurance requirements for this work.

Signature

Date

Insurance Requirement Sheet

Insurance Requirements: Before starting and until final completion and acceptance of the work called for in the Contract and expiration of the guarantee period provided for in the Contract, the Contractor and its subcontractors, if any, shall procure and maintain insurance of the types and amounts checked in paragraphs A through F below for all Contract operations.

- ☒ A. General Liability, with minimum coverages for combined bodily injury and property damage liability of \$2,000,000 general aggregate, \$1,000,000 per occurrence including:
- ☒ 1. Commercial General Liability.
 - ☒ 2. Town as additional insured.
 - ☐ 3. Owners and Contractors Protective Liability
(separate policy in the name of the Town).
- ☒ B. Comprehensive Automobile Liability, with minimum coverages of \$1,000,000 combined single limit for bodily injury and property damage, including, where applicable, coverage for any vehicle, all owned vehicles, scheduled vehicles, hired vehicles, non-owned vehicles and garage liability.
- ☒ C. Excess Liability, with minimum coverage of \$5,000,000 in umbrella form, or such other form as approved by Town Department Head and Risk Management Director.
- ☒ D. Workers' Compensation and Employer's Liability, with minimum coverages as provided by Connecticut State Statutes.
- ☐ E. Professional Liability (for design and other professionals for Errors and Omissions), with minimum coverage of \$1,000,000. If the policy is on a claims-made basis, coverage shall be continually renewed or extended for three (3) years after work is completed under the Contract.
- ☐ F. Other (Builder's Risk, etc.): _____.
- ☒ G. **CERTIFICATE HOLDER: TOWN OF GREENWICH**
ATTN: BOARD OF EDUCATION. (Also fill in on ACORD Certificate of Insurance)
101 Field Point Road, Greenwich, CT 06830.

The **Acord certificate of insurance form** must be executed by your insurance agent/broker and returned to this office. The most current Acord form should be used for insurance documentation purposes. Company name and address must conform on all documents including insurance documentation. It is required that the agent/broker note the individual insurance companies providing coverage, rather than the insurance group, on the Acord form. The Contract number (provided to the awarded Contractor), project name and a brief description must be inserted in the "Description of Operations" field. It must be confirmed on the Acord Form that the Town of Greenwich and Greenwich Public Schools is endorsed as an additional insured by having the appropriate box checked off and stating such in the "Description of Operations" field. **A letter from the awarded vendor's agent/broker certifying that the Town of Greenwich, The Greenwich Board of Education and Landmark Facilities Group have been endorsed onto the general liability policy as an additional insured is also mandatory. This letter must follow exactly the format provided by the Purchasing Department and must be signed by the same individual authorized representative who signed the Acord form, both of which must be signed with original ink "wet" signatures.** If the insurance coverage required is provided on more than one Acord certificate of insurance, then additional agent/broker letters are also required. Contract development will begin upon receipt of complete, correct insurance documentation.

The Contractor shall be responsible for maintaining the above insurance coverages in force to secure all of the Contractor's obligations under the Contract with an insurance company or companies with an AM Best Rating of A:VII or better, licensed to write such insurance in Connecticut and acceptable to the Risk Manager, Town of Greenwich. For excess liability only, non-admitted insurers are acceptable, provided they are permitted to do business through Connecticut excess line brokers per listing on the current list of Licensed Insurance Companies, Approved Reinsurers, Surplus Lines Insurers and Risk Retention Groups issued by the State of Connecticut Insurance Department.

(SAMPLE ENDORSEMENT LETTER)

**AGENT/BROKER
(LETTERHEAD)**

(Date)

Eugene H. Watts, Senior Buyer
Purchasing Department
Town of Greenwich/Board of Education
290 Greenwich Ave – Havemeyer Building
Greenwich, CT 06830

Re: Contract # _____

Dear Mr. Watts:

The undersigned hereby certifies as follows:

- (1) I am a duly licensed insurance agent under the laws of the State of **[insert State]** and an authorized representative of all companies affording coverage under the Acord form submitted herewith;
- (2) The Town of Greenwich, the Greenwich Board of Education, and Landmark Facilities Group have been endorsed as an additional insured under the general liability policy no. [insert policy number], issued by **[insert company affording coverage]** to **[name of insured]**;
- (3) The general liability policy referenced in paragraph (2) above meets or exceeds the coverage in Commercial General Liability ISO form CG 00 01 10 01, including contractual liability;
- (4) The policies listed in the Acord form submitted to the Town of Greenwich in connection with the above-referenced contract have been issued to the insured in the amounts stated and for the periods indicated in the Acord form; and
- (5) The Town of Greenwich shall be given thirty (30) days prior written notice of cancellation, lapse or restrictive amendment (except ten days notice of nonpayment) of the policies listed in the Acord form.

Sincerely,

*Authorized Representative for all companies listed in the Acord form
(Acord & Endorsement Letter must be signed by the same individual in blue ink)*

ACORD

CERTIFICATE OF LIABILITY INSURANCE

PRODUCER		THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER, THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.																			
		INSUREERS AFFORDING COVERAGE																			
Vendor Name & Address Contract # _____		INSURER A:																			
		INSURER B:																			
		INSURER C:																			
		INSURER D:																			
		INSURER E:																			
COVERAGES																					
THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OF CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.																					
INSR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE(MM/DD/YY)	POLICY EXPIRATION DATE(MM/DD/YY)	LIMITS																
	GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE ☒ OCCUR ☐ _____ ☐ _____ GENERAL AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☐ PROJECT ☐ LOC				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">EACH OCCURENCE</td> <td style="width: 40%;">\$1,000,000</td> </tr> <tr> <td colspan="2">FIRE DAMAGE (Any one fire)</td> </tr> <tr> <td colspan="2">MED EXP (Any one person)</td> </tr> <tr> <td colspan="2">PERSONAL & ADV INJURY</td> </tr> <tr> <td>GENERAL AGGRREGATE</td> <td>\$2,000,000</td> </tr> <tr> <td colspan="2">PRODUCTS-COMP/OP AGG</td> </tr> <tr> <td colspan="2"> </td> </tr> </table>	EACH OCCURENCE	\$1,000,000	FIRE DAMAGE (Any one fire)		MED EXP (Any one person)		PERSONAL & ADV INJURY		GENERAL AGGRREGATE	\$2,000,000	PRODUCTS-COMP/OP AGG					
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AGGREGATE	\$5,000,000																				
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/ EXECUTIVE/OFFICER/ MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATION below.	Y/N ☐			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;">X</td> <td style="width: 65%;">PER STATUTE</td> <td style="width: 5%;"></td> <td style="width: 25%;">OTHER</td> </tr> <tr> <td colspan="4">E.L. EACH ACCIDENT</td> </tr> <tr> <td colspan="4">E.L. DISEASE-EA EMPLOYEE</td> </tr> <tr> <td colspan="4">E.L. DISEASE - POLICY LIMIT</td> </tr> </table>	X	PER STATUTE		OTHER	E.L. EACH ACCIDENT				E.L. DISEASE-EA EMPLOYEE				E.L. DISEASE - POLICY LIMIT			
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E.L. EACH ACCIDENT																					
E.L. DISEASE-EA EMPLOYEE																					
E.L. DISEASE - POLICY LIMIT																					
	Professional Liability																				
DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS																					
The Town of Greenwich, The Greenwich Board of Education, and Landmark Facilities Group, Inc. are named as additional insured for Contract #. It is agreed by all parties to Contract # that the Contractors insurance will be primary and non-contributory.																					
CERTIFICATE HOLDER	X	ADDITIONAL INSURED; INSURER LETTER: __		CANCELLATION																	
Certificate Holder: Town of Greenwich and Greenwich Board of Education 101 Field Point Road Greenwich, CT 06830				SHOULD ANY OF THE ABOVE-DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OF REPRESENTATIONS																	
				AUTHORIZED REPRESENTATIVE																	

A.M. BEST KEY RATING GUIDE FORM

The following insurance companies are licensed in the State of Connecticut per the 2021 edition of the **A.M. Best Key Rating Guide For Property and Casualty**,

1. Company Name: _____

a. Page Number: _____

b. Rating is: _____

2. Company Name: _____

a. Page Number: _____

b. Rating is: _____

3. Company Name: _____

a. Page Number: _____

b. Rating is: _____

4. Company Name: _____

a. Page Number: _____

b. Rating is: _____

5. Company Name: _____

a. Page Number: _____

b. Rating is: _____

AFFIRMATIVE ACTION COMPLIANCE AFFIDAVIT

**COMMISSION ON HUMAN RIGHTS AND OPPORTUNITIES
CONTRACT COMPLIANCE REGULATIONS
NOTIFICATION TO BIDDERS**

AFFIRMATIVE ACTION COMPLIANCE AFFIDAVIT

The contract to be awarded is subject to contract compliance requirements mandated by Sections 4a-60 and 4a-60a of the Connecticut General Statutes; and, when the awarding agency is the State, Sections 46a-71(d) and 46a-81i(d) of the Connecticut General Statutes. There are Contract Compliance Regulations codified at Section 46a-68j-21 through 43 of the Regulations of Connecticut State Agencies, which establish a procedure for awarding all contracts covered by Sections 4a-60 and 46a-71(d) of the Connecticut General Statutes. According to Section 46a-68j-30(9) of the Contract Compliance Regulations, every agency awarding a contract subject to the contract compliance requirements has an obligation to “aggressively solicit the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials.” “Minority business enterprise” is defined in Section 4a-60 of the Connecticut General Statutes as a business wherein fifty-one percent or more of the capital stock, or assets belong to a person or persons: “(1) Who are active in daily affairs of the enterprise; (2) who have the power to direct the management and policies of the enterprise; and (3) who are members of a minority, as such term is defined in subsection (a) of Section 32-9n.” “Minority” groups are defined in Section 32-9n of the Connecticut General Statutes as “(1) Black Americans . . . (2) Hispanic Americans . . . (3) persons who have origins in the Iberian Peninsula . . . (4) Women . . . (5) Asian Pacific Americans and Pacific Islanders; (6) American Indians . . .” An individual with a disability is also a minority business enterprise as provided by Section 4a-60g of the Connecticut General Statutes. The above definitions apply to the contract compliance requirements by virtue of Section 46a-68j-21(11) of the Contract Compliance Regulations.

The awarding agency will consider the following factors when reviewing the bidder’s qualifications under the contract compliance requirements:

- (a) the bidder’s success in implementing an affirmative action plan;
- (b) the bidder’s success in developing an apprenticeship program complying with Sections 46a-68-1 to 46a-68-17 of the Administrative Regulations of Connecticut State Agencies, inclusive;
- (c) the bidder’s promise to develop and implement a successful affirmative action plan;
- (d) the bidder’s submission of employment statistics contained in the “Employment Information Form”, indicating that the composition of its workforce is at or near parity when compared to the racial and sexual composition of the workforce in the relevant labor market area; and
- (e) the bidder’s promise to set aside a portion of the contract for legitimate minority business enterprises. See Section 46a-68j-30(10)(E) of the Contract Compliance Regulations.

Standby Generator Installation at Cos Cob School

***INSTRUCTIONS:** Bidders must sign acknowledgement below and return acknowledgement to Awarding Agency along with bid proposal.

The undersigned acknowledges receiving and reading a copy of the “Notification to Bidders” form.

Signature

Date

On behalf of:

CONSENT OF SURETY

The Undersigned surety, being the surety which issued bonds No. _____ for the Town of Greenwich Contract No. _____ hereby consents to release of final payment and all retainages to the contractor-principal.

(Name of Surety)

By _____
Its

ACKNOWLEDGMENT

STATE OF

ss:

COUNTY OF

This is to certify the above signatory who executed this instrument was either known to me or satisfactorily proven to me to be the person whom he purports to be.

Notary Public

AFFIDAVIT FOR FINAL PAYMENT

The undersigned, being duly sworn, deposes and says:

1. That he is the _____ of the contractor in
(Title)
the project hereinafter referred to and is authorized to execute this affidavit on behalf of the contractor;

2. In connection with Contract # _____ for _____
(Project Title)

it is represented that all payrolls, bills for services, materials, supplies, equipment, and other indebtedness have been paid or otherwise satisfied and that there are no outstanding claims against the undersigned by any sub-contractor or material supplier, or no outstanding claims or intent to file a claim against the Town of Greenwich.

This Affidavit is made at the request of the Town of Greenwich for the purpose of inducing final payment and knowing that it will rely upon the truth of the representation herein made.

(Authorized signature)

(Type or print name of authorized person)

Subscribed and sworn to before me, a Notary

Public, in and for the County of _____

and State of _____, this _____ day

of _____, 2025

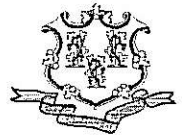
Notary Public

LIST OF DRAWINGS

SECTION / DRAWING NO.	DESCRIPTION
T-001	COVER SHEET
T-002	PROJECT NOTES & DESCRIPTION
P-001	PLUMBING NOTES, DETAILS, LEGEND, AND SYMBOLS
P-002	PLUMBING DETAILS
P-101	PLUMBING FIRST FLOOR AND SECOND FLOOR ROOF PART PLANS
E-001	ELECTRICAL LEGEND, NOTES, & ABBREVIATIONS
E-100	FIRST FLOOR ELECTRICAL POWER PLAN – SOUTH
E-101	FIRST FLOOR ELECTRICAL POWER PLAN – NORTH
E-102	SECOND FLOOR ELECTRICAL POWER PLAN
E-103	THIRD FLOOR AND MECHANICAL PENTHOUSES ELECTRICAL POWER PLANS
ER-110	ENLARGED FIRST FLOOR ELECTRICAL POWER REMOVALS PLAN
E-110	ENLARGED FIRST FLOOR ELECTRICAL POWER PLAN
E-120	ELECTRICAL SITE PLAN
ER-200	REMOVALS ONE LINE DIAGRAM
E-200	ONE LINE DIAGRAM
E-201	ELECTRICAL GROUNDING DIAGRAM
E-300	ELECTRICAL DETAILS & FEEDER LEGEND
E-400	ELECTRICAL PANEL SCHEDULES
E-401	ELECTRICAL PANEL SCHEDULES
E-402	ELECTRICAL SCHEDULES

Form AU-764

Deposit by a Person Doing Business With a Nonresident Contractor



Purpose: A person doing business with a nonresident contractor uses **Form AU-764** to deposit 5% of the total contract price with the Department of Revenue Services (DRS) for a specific project in the state. The deposit ensures all taxes due to the State of Connecticut from the contractor are paid to DRS. Read the instructions on the reverse side before you complete this form. If you need help, call **860-541-3280**, Monday through Friday, 8:00 a.m. to 5:00 p.m., and choose Option 7.

Part I: Nonresident Contractor Information			
Name		Connecticut Tax Registration No.	
Address (Street or PO Box, City, State, and ZIP Code)			
Part II: Person Doing Business With a Nonresident Contractor Information			
Name		Connecticut Tax Registration No., Federal ID No., or SSN	
Address (Street or PO Box, City, State, and ZIP Code)			
Part III: Project Information			
Physical Location of Project (Street, City or Town)		Name of Project	
Commencement Date	Completion Date for Nonresident Contractor	Total Contract Price or Amount of Change Order ☐ Check the box if this deposit is for a change order	Amount of Deposit
Conditions of the deposit for the project detailed above: - The nonresident contractor has entered into a contract related to real property at a Connecticut location. - The person doing business with the nonresident contractor is depositing 5% of the total contract price with DRS to ensure all taxes that become due and owing during the period of the contract will be paid. - The deposit is made within 30 days of the completion of the project. - The deposit will be returned to the nonresident contractor upon written request by the contractor after DRS has examined its records and determined all taxes, interest, and penalties due during the term of the contract have been paid. - The person doing business with the nonresident contractor must attach a copy of the final periodic billing to Form AU-764.			
Declaration: I, an authorized agent of the person doing business with a nonresident contractor named above, declare under the penalty of law that I have examined Form AU-764 and, to the best of my knowledge and belief it is true, complete, and correct. I understand the penalty for willfully delivering a false document or return to DRS is a fine of not more than \$5,000, or imprisonment for not more than five years, or both.			
Print Name		Title	
Authorized Signature		Date	
Receipt of Deposit: DRS acknowledges receipt of \$ _____ from the person named above as doing business with a nonresident contractor related to real property at the Connecticut location noted above.			
Signature of Authorized DRS Representative		Telephone	Date

General Instructions

A person doing business with a nonresident contractor working in Connecticut must submit **Form AU-764, *Deposit by a Person Doing Business With a Nonresident Contractor***, with a deposit of 5% of the total contract price, including change orders and add-ons, not later than 30 days after the completion of the contract. This applies to all contracts with nonresident contractors, regardless of the nature of the real property affected or the tax-exempt status of the property owner. For more information, see **Special Notice 2003(20), *Legislation Affecting Contracts With Nonresident Contractors***.

A *nonresident contractor* is a contractor who does not maintain a regular place of business in this state. A *regular place of business* means any bona fide office, factory, warehouse, or other space in Connecticut at which a contractor is doing business in its own name in a regular and systematic manner, and which place is continuously maintained, occupied, and used by the contractor in carrying on its business through its employees regularly in attendance to carry on the contractor's business in the contractor's own name. A regular place of business does not include a place of business for a statutory agent for service of process or a temporary office whether or not it is located at the site of construction. A regular place of business also does not include locations used by the contractor only for the duration of the contract, such as short-term leased offices, warehouses, storage facilities, or facilities that do not have full time staff with regular business hours. An office maintained, occupied and used by a person affiliated with a contractor is not a regular place of business of the contractor.

Specific Instructions

Part I: Enter the name and complete address of the nonresident contractor on whose behalf the deposit is being made. Include the nonresident contractor's Connecticut tax registration number.

Part II: Enter the name and complete address of the person doing business with the nonresident contractor. If the nonresident contractor is the general contractor, enter the name and address of the owner of the property. If the nonresident contractor is a subcontractor, enter the name and address of the general contractor.

Enter the Connecticut tax registration number of the person doing business with the nonresident contractor. If the person doing business with the nonresident contractor does not have a Connecticut tax registration number, enter that person's Federal Employer Identification Number or Social Security Number.

Part III: Enter the name of the project and the complete address, including the street address and the city or town where the project is physically located.

Enter the commencement date of this project. The commencement date is the date the contract is signed or the date the nonresident contractor begins work on the project, but it is never later than the date the nonresident contractor begins work.

Enter the date on which work on this project was completed, which is the date the final periodic billing for the contract was made by the nonresident contractor. Note the final periodic billing may be due before payment of any retainage becomes due. The person making the deposit must attach a copy of the final periodic billing to **Form AU-764**.

If this is a deposit for a change order occurring after the deposit for the initial contract has been remitted to DRS, enter the additional amount being deposited for the change order and check the box. For a change order made after the final periodic billing for the original contract, the change order is deemed complete when it is billed by the nonresident contractor. Attach a copy of the final billing for the change order.

Enter, in words and figures, the total amount paid to the nonresident contractor under the contract or for the change order. Check the box if the deposit is for a change order.

Multiply the total contract price or the amount of the change order by 5% (.05) and enter the result on this line.

Declaration: An authorized representative of the person doing business with a nonresident contractor must sign and date the declaration. Return **Form AU-764**, with the copy of the final periodic billing, to:

Department of Revenue Services
State of Connecticut
Discovery Unit
25 Sigourney Street
Hartford CT 06106

Receipt: DRS will acknowledge receipt of the deposit by completing the bottom of Form AU-764 and returning a copy of it to the person making the deposit. Unless indicated otherwise, the person doing business with the nonresident contractor will not be liable for any claim of the nonresident contractor for the amount or for any claim of DRS for any taxes arising from the activities of the nonresident contractor on the project for which the bond deposit was made, once DRS has verified that total deposits represent 5% of the total contract price paid to the nonresident contractor for this project, including any change orders, and that the deposit is made within 30 days of completion of the project.

Form REG-1

Business Taxes Registration Application

1. Reason for Filing Form REG-1 Check the applicable box:

DRS use only Connecticut Tax Registration Number

- ☐ Opening a new business including but not limited to:
- a. An existing out-of-state business opening a location in Connecticut;
 - b. Selling at a craft show, flea market, fair, or other venue in Connecticut or selling over the Internet; or
 - c. An existing out-of-state business having employees in Connecticut (including nonresident contractors and loan-out companies).
- ☐ Opening a new location. Enter your Connecticut Tax Registration No: _____
- ☐ Registering for additional taxes. Enter your Connecticut Tax Registration No: _____
- ☐ Reopening a closed business.
Enter Connecticut Tax Registration No. of the closed business: _____
- ☐ Purchasing an ongoing business. The buyer of an existing business may be responsible for tax liabilities of the previous owner. See the Informational Publication on Successor Liability for Sales and Use Taxes, Admissions and Dues Tax, and Connecticut Income Tax Withholding, on the DRS website.
Enter Connecticut Tax Registration No. of the previous owner: _____
- ☐ Forming a business entity under Connecticut law or a non-Connecticut entity required to register with or to obtain a certificate of authority from the Connecticut Secretary of the State before transacting business in Connecticut.
- ☐ Establishing a passive investment company (PIC).
- ☐ Changing organization type. Enter your current Connecticut Tax Registration No: _____
- ☐ Hiring household employees and intend to withhold Connecticut income tax.
- ☐ Other (explain); see *Who Needs to Complete REG-1*. _____

2. Business Information: Type of organization

- ☐ Sole proprietorship ☐ Single member LLC (SMLLC) ☐ Corporation
- ☐ General partnership ☐ Single member LLC taxed as a corporation ☐ S Corporation
- ☐ Single member LLC taxed as an S corporation ☐ Qualified subchapter S subsidiary (QSSS)
- ☐ Limited liability partnership (LLP) ☐ Limited liability company (LLC) taxed as a partnership
- ☐ Limited liability company (LLC) taxed as a corporation
- ☐ Limited partnership (LP) ☐ Limited liability company (LLC) taxed as an S corporation
- ☐ Limited partnership taxed as a corporation ☐ Other (explain): _____

3. Nature of Business Activity

Check the box(es) that best describe your business:

- ☐ Retailer ☐ Wholesaler ☐ Manufacturer ☐ Service provider ☐ Other (explain): _____

4. Major Business Activity

Describe your major business activities: _____

5. Business Name and Address

Organization name: Enter the name of the sole proprietor, partnership, corporation, or LLC.		Federal Employer Identification Number, if applicable
Business trade name		CT Secretary of the State Business ID No., if applicable
Business Location: Enter the physical address of the business. A post office box or rural route number is not acceptable. Home-based businesses and flea market or craft show vendors must enter a home address.		
Address line 1		Address line 2
City	State	ZIP code
Mailing address line 1 (Street or PO Box)		Address line 2
City	State	ZIP code
Business telephone number	Email address	Bank name

6. List All Owners, Partners, Corporate Officers, or LLC Members Attach a separate sheet if needed.

Name (last, first, middle initial)			Title
Home address line 1 (street)		Home address line 2	
City	State	ZIP code	Home telephone number
SSN	Date of birth	Bank name	

Name (last, first, middle initial)			Title
Home address line 1 (street)		Home address line 2	
City	State	ZIP code	Home telephone number
SSN	Date of birth	Bank name	

Name (last, first, middle initial)			Title
Home address line 1 (street)		Home address line 2	
City	State	ZIP code	Home telephone number
SSN	Date of birth	Bank name	

Name (last, first, middle initial)			Title
Home address line 1 (street)		Home address line 2	
City	State	ZIP code	Home telephone number
SSN	Date of birth	Bank name	

7. Income Tax Withholding

Are you an employer that transacts business or maintains an office in Connecticut and intends to pay wages to resident employees or nonresident employees who work in Connecticut?..... ☐ Yes ☐ No

If you have a Connecticut tax registration number for withholding for another location and intend to file withholding for this new location under that number, enter that number here: _____ and skip to Section 8; otherwise continue.

Are you an out-of-state company voluntarily registering to withhold Connecticut income tax for your Connecticut resident employees who work outside of Connecticut?..... ☐ Yes ☐ No

Do you intend to withhold Connecticut income tax from pension plans, annuity plans, retirement distributions, or gambling distributions? ☐ Yes ☐ No

Do you pay nonresident athletes or entertainers for services they render in Connecticut? ☐ Yes ☐ No

Do you only have household employees and wish to withhold Connecticut income tax?..... ☐ Yes ☐ No

Do you only have agricultural employees and wish to withhold Connecticut income tax?..... ☐ Yes ☐ No

If **Yes**, do you file federal Form 943, Employer's Annual Tax Return for Agricultural Employees, and wish to file **Form CT-941, Connecticut Quarterly Reconciliation of Withholding**, annually? ☐ Yes ☐ No

If you answered **Yes** to any of the income tax withholding questions, enter the date you will start withholding Connecticut income tax. m m d d y y

If you use a payroll service, enter the name of the payroll company: _____

8. Sales and Use TaxesDo you sell, or will you be selling, goods in Connecticut (either wholesale or retail)? ☐ Yes ☐ NoDo you rent equipment or other tangible personal property to individuals or businesses in Connecticut? ☐ Yes ☐ NoDo you serve meals or beverages in Connecticut? ☐ Yes ☐ NoDo you provide a taxable service in Connecticut? See the Informational Publication, *Getting Started in Business*, and the *Special Notice on Legislative Changes Affecting the Sales and Use Taxes*, on the DRS website, for a list of taxable services..... ☐ Yes ☐ NoIf you answered **Yes** to any of the sales and use taxes questions, enter the date you will start selling or leasing goods or taxable services. m m d d y y**8a Prepaid Wireless Service E 9-1-1**Do you sell prepaid wireless service in Connecticut?..... ☐ Yes ☐ NoIf you answered **Yes**, enter the date you will start to sell these in Connecticut. m m d d y y**9. Room Occupancy Tax**Do you provide lodging rooms for rent in a hotel, motel, or rooming house in Connecticut for 30 consecutive days or less? ☐ Yes ☐ NoIf you answered **Yes**, enter the date you will start to provide rooms for rent for lodging purposes in Connecticut. m m d d y y**10. Business Entity Tax** Do not complete this section if the entity is liable for the corporation business tax.The **business entity tax** applies to all of the following business types formed under Connecticut law and to those non-Connecticut entities required to register with or obtain a certificate of authority from the Connecticut Secretary of the State before transacting business in the state, whether or not the business has registered or filed a certificate of authority, as the case may be, with the Connecticut Secretary of the State.

- S corporations (Qualified subchapter S subsidiaries (QSSS) are not liable for the business entity tax.);
- Limited liability companies (LLCs or SMLLCs) — any limited liability company that is, for federal income tax purposes, either:
- Treated as a partnership if it has two or more members; or
- Disregarded as an entity separate from its owner if it has a single member;
- Limited liability partnerships (LLPs); and
- Limited partnership (LPs).

Are you a business entity as described above? ☐ Yes ☐ No

Enter state you are organized under: Enter date of organization. m m d d y y

If not organized in Connecticut, enter the earlier of the date you started business in Connecticut or the date you registered with the Connecticut Secretary of the State. m m d d y y

Enter the month your tax year closes:

11. Corporation and Unrelated Business Income Taxes**Corporation Business Tax** Do not complete this section if the entity is liable for the business entity tax.Are you a corporation? ☐ Yes ☐ NoAre you an LLC, SMLLC, or other association taxed as a corporation?..... ☐ Yes ☐ NoIs this corporation exempt from federal income tax? ☐ Yes ☐ NoHave you received a determination from the Internal Revenue Services (IRS) that this corporation is exempt from federal income tax? ☐ Yes ☐ NoIf **Yes**, enclose a copy of your IRS letter of determination.

Enter state you are organized under: Enter date of organization. m m d d y y

If not a Connecticut corporation, enter the earlier of the date you started business in Connecticut or the date you registered with the Connecticut Secretary of the State. m m d d y y

Enter the month the corporate year closes:

Unrelated Business Income TaxAre you a federally exempt organization that has unrelated business income attributable to a trade or business in Connecticut?..... ☐ Yes ☐ NoIf you answered **Yes**, enter the date the unrelated business income tax liability started. m m d d y y**Passive Investment Company (PIC)**Is this corporation a passive investment company as defined in Conn. Gen. Stat. §12-213(a)(27)? ☐ Yes ☐ No

Enter the date the PIC was organized. m m d d y y

Enter Connecticut tax registration number of the PIC's related financial service or insurance company:

12. Business Use Tax

If you are registered for or are registering for sales and use taxes, you do not need to complete this section.

Business use tax is due when a business purchases taxable goods or services including the purchase or lease of assets, consumable goods, and promotional items, for use in Connecticut without paying Connecticut sales tax.

Will you be purchasing taxable goods or services for use in Connecticut without paying Connecticut sales tax? ☐ Yes ☐ No

If you answered **Yes** to the business use tax question, **enter the tax liability start date.** m m d d y y

If you answered **No**, you must complete the *Business Use Tax Declaration* section below.

Business Use Tax Declaration: By registering for any of the taxes listed in this application, you have indicated to the Department of Revenue Services (DRS) that you may have a business use tax liability. Therefore, based on your application, you will be automatically registered for the business use tax unless you complete the following declaration.

I, _____ (name of taxpayer or authorized representative of taxpayer), acknowledge I have read and understand the information concerning the business use tax and declare I will not be liable for business use tax. Please initial here. _____

13. Registration Fee Schedule

Enter the registration fee amount indicated. If you are liable for either sales and use taxes or room occupancy tax, or both, as indicated in Sections 8 or 9, you must pay a \$100 registration fee. Enter the appropriate registration fee(s) from Addendum A if you are registering for the cigarette tax. You must include the total registration fee due with Form REG-1 or your registration application **will not be processed** and will be returned.

Make your check payable to: **Commissioner of Revenue Services**. If you register by mail, send Form REG-1 with your payment to: Department of Revenue Services, PO Box 2937, Hartford CT 06104-2937

Registration Fee

a.	If registering for sales and use taxes or room occupancy tax , enter \$100.*	a.	
b.	If registering for cigarette tax , see Addendum A.	b.	
c.	Total registration fee due: Add Line a and Line b.	c.	

* No fee is required for room occupancy tax if you are registered or are registering for sales and use taxes.

14. All Applicants Must Sign the Following Declaration

I declare under penalty of law that I have examined this application and, to the best of my knowledge and belief, it is true, complete, and correct. I understand the penalty for willfully delivering a false application to DRS is a fine of not more than \$5,000, or imprisonment for not more than five years, or both.

Sign here and keep a copy for your records.	Signature of owner, partner, LLC member, or corporate officer	Date	Telephone number
	Print name of owner, partner, LLC member, or corporate officer	Title	

Instructions for Form REG-1 Business Taxes Registration Application

How to Register

On-line Registration

Save time and register for a Connecticut tax registration number at your convenience when you file **Form REG-1, Business Taxes Registration Application**, on-line at the Department of Revenue Services (DRS) Web site at www.ct.gov/DRS. You will receive your tax registration number in the mail in about six days. If you owe a registration fee, you must pay the fee electronically by entering the account number and routing number for your checking or savings account.

If you are registering for a tax type that requires you attach Addendum B to the REG-1 or if you are registering as a cigarette retailer (included on Addendum A), you may register on-line. If you are registering for another tax type that requires you attach Addendum A, C, D, or E to the REG-1, you must register by mail or in person at any DRS office.

Mail in Registration

Complete Form REG-1 and mail it to DRS at:

Department of Revenue Services
PO Box 2937
Hartford CT 06104-2937

If you owe a registration fee, you must include payment by check or money order with the application. You will receive your Connecticut tax registration number in the mail in 5 to 6 weeks.

Walk-in Registration

You may file Form REG-1 in person at any DRS office. You will be issued a Connecticut tax registration number immediately. Bring a photo identification, such as a driver's license, and a check or money order if you owe a registration fee. (Cash is accepted at the Hartford location only.)

DRS offices are located in:

Bridgeport 10 Middle St. 203-336-7890	Hamden 3074 Whitney Ave. 203-287-8243	Hartford 25 Sigourney St. 860-297-5962
Norwich 2 Cliff St. 860-889-2669	Waterbury 55 West Main St., Suite 100 203-805-6789	

The application must be signed by the individual owner, partner, officer of the corporation, member of the limited liability company, or another who has written authorization to sign in the form of a Power of Attorney. If anyone other than the owner brings the signed application to the office and wants to obtain the registration as owner, he or she must have written authorization from the owner to obtain the registration on his or her behalf.

Purpose of Form REG-1

Use Form REG-1 to obtain a Connecticut tax registration number or to register for additional tax types under your current Connecticut tax registration number.

Use Form REG-1 to register for any of these taxes:

- Business entity tax
- Business use tax
- Corporation business tax (including PIC)
- Income tax withholding
- Room occupancy tax
- Sales and use taxes
- Unrelated business income tax

In addition to Form REG-1, you must complete and attach the appropriate addendum as noted to Form REG-1 to register for any of these taxes. The forms are available on the DRS Web site at www.ct.gov/DRS.

REG-1 Addendum A:

- Cigarette taxes
- Tobacco products tax

REG-1 Addendum B:

- Admissions and dues taxes
- Dry cleaning surcharge
- Motor vehicle rental surcharge
- Tourism surcharge

REG-1 Addendum C:

- Motor fuels tax
- Petroleum products gross earnings tax

REG-1 Addendum D:

- Alcoholic beverages tax

REG-1 Addendum E:

- Community antenna television system companies tax
- Railroad companies tax
- Satellite companies tax
- Solid waste assessment
- Suppliers of natural gas
- Utility companies tax

Registering for Other Tax Types

To register for these taxes, use the form listed:

- Authority to Collect Use Tax REG-7
- International Fuel Tax Agreement (IFTA) CT-IFTA-2
- Motor Carrier Road Tax REG-3MC

For more information on registering with the Department of Revenue Services (DRS), visit DRS Web site at www.ct.gov/DRS or call 1-800-382-6453 (in-state) or 860-297-5962 (toll-free).

Who Needs to Register with the DRS?

Businesses must register with the Connecticut DRS if they:

- Have people working in Connecticut
- Withhold Connecticut income tax
- Operate a business in Connecticut
- Are required to file an annual report with the Connecticut Secretary of the State and are subject to the business entity tax
- Provide taxable services in Connecticut
- Sell, rent, or lease goods in Connecticut (wholesale or retail)
- Furnish space for storage of tangible personal property
- Have a manufacturing facility in Connecticut
- Serve meals or beverages in Connecticut
- Purchase taxable goods or services for use in Connecticut
- Provide lodgings in Connecticut subject to the room occupancy tax
- Carry on a business as a corporation in Connecticut
- Distribute alcoholic beverages in Connecticut
- Distribute motor fuel used to propel motor vehicles on public highways or roads in Connecticut
- Sell petroleum products in Connecticut
- Operate a place of amusement, entertainment, or recreation in Connecticut
- Operate a social, health, athletic, or sporting club in Connecticut
- Sell or distribute cigarettes or tobacco products in Connecticut
- Own, lease, maintain, operate, manage, or control a community antenna television system in Connecticut
- Provide satellite television services to Connecticut
- Operate a railroad in Connecticut on a for-profit basis
- Are a resources recovery facility in Connecticut
- Market natural gas to an end user in Connecticut
- Provide distribution or transmission services for electricity in Connecticut
- Sell electricity as a municipality to customers in Connecticut
- Manufacture, sell, or distribute gas to be used for light, heat, or power in Connecticut
- Operate a dry cleaning establishment in Connecticut

Registration Fees

Sales and use taxes	\$ 50
Room occupancy tax*	\$ 50
Cigarette dealer's license	\$ 25
Cigarette distributor's license	\$ 1,000
Cigarette distributor chain operator	
5 to 14 retail locations	\$ 250
15 to 24 retail locations	\$ 500
25 or more retail locations	\$1,000
Cigarette manufacturer/importer	\$5,000
Distributor of tobacco products	\$100

* No fee is required for room occupancy tax if you are registered or are registering for sales and use taxes.

Electronic Filing Methods

Once you are registered with DRS, you may file certain tax forms by Internet or telephone using the DRS *Fast-File* program. Look for this logo.



Informational Publications

See Informational Publication 2003(28), *Getting Started in Business*, available on the DRS Web site at www.ct.gov/DRS

Connecticut Licensing Requirements

For information on other Connecticut licensing requirements, visit www.ct-cllc.com.

DRS Web Site

Visit the DRS Web site at www.ct.gov/DRS and click on *Businesses*.

Personal assistance is available by telephone or at any DRS office locations, Monday through Friday, during business hours.

CONN-TAX, the DRS telephone information line, is available anytime.

- 1-800-382-9463 (in-state) or
- 860-297-5962 (from anywhere).

TTY, TDD, and Text Telephone users only may transmit inquiry anytime by calling 860-297-4911.

Additional forms and publications are available anytime:

- **Internet:** Visit the DRS Web site at www.ct.gov/DRS
- **DRS TAX-FAX:** Call 860-297-5698 from the handset attached to your fax machine and select from the menu. Only forms (not publications) are available through TAX-FAX; or
- **Telephone:** Call 1-800-382-9463 (in-state) and select Option 2 from a touch-tone telephone, or 860-297-4753 (from anywhere).

Application Instructions

Complete the entire application unless the section instructions indicate otherwise. Answering Yes to any question in Sections 7 through 12 means you may have a Connecticut tax liability for that tax. In each section where you answer Yes to any question, you must indicate the date you first incurred a tax liability in Connecticut for that tax type.

Exceptions:

- Taxpayers with a valid Connecticut tax registration number who wish to register for another tax must complete Sections 1 through 6, Section 14, and the section for the specific tax type(s) for which you wish to register. See the section *Part of Form REG-1* on Page 1 of these instructions to determine if you have to complete an addendum to Form REG-1.
- Household employers who pay wages to and intend to withhold Connecticut income tax for housekeepers, nannies, health aides, caretakers, etc. – complete Sections 1 through 7 and 14 only.

THE FOLLOWING PAGES ARE A SAMPLE COPY OF THE TOWN
OF GREENWICH CONTRACT FOR YOUR REVIEW. YOU MUST
BE ABLE TO SIGN THIS CONTRACT AND MEET THE NECESSARY
INSURANCE AS REQUIRED BY THE TOWN OF GREENWICH IN
ORDER FOR YOUR PROPOSAL TO BE CONSIDERED.

AGREEMENT CONTRACT NO.

THIS AGREEMENT, executed this day of in the year Year-Two Thousand Twenty Five (herein referred to as the "AGREEMENT"), by and between the Town of Greenwich, Connecticut, acting through _____ hereunto duly authorized, "OWNER" and _____, acting through _____ (insert name of individual and title) duly authorized, "CONTRACTOR".

WITNESSETH, that the parties to these presents, each in consideration of the under-taking, promises and agreements on the part of the other herein contained, have undertaken, promised and agreed to do hereby undertake, promise and agree, the Owner for itself, its successors and assigns, and the Contractor for himself and his heirs, executors, administrators, successors and assigns, as follows:

1. DEFINITIONS:

Wherever the words hereinafter defined or pronouns used in their stead occur in the Contract Documents, they shall have the following meaning:

The word "Owner" shall mean the Town of Greenwich and shall include its authorized representative.

The word "Contractor" shall mean the person or organization identified as such in this Agreement and shall include his authorized representative.

The words "Contracting Officer or Agency" shall mean that official of the Town which awards the contract, executes the Agreement and is the Owner's authorized representative.

The Information for Bidders, the Contractor's Bid as accepted by the Owner, the Contract Conditions and Specifications and the General, Technical and Materials Specifications, the Drawings, and all addenda and amendments to any of the foregoing, collectively constitute the Contract Documents, and are sometimes herein referred to as the "Contract".

2. **DESCRIPTION OF WORK:**

3. PAYMENT:

The Contractor shall be paid on a monthly basis after presentation of vouchers, and subject to acceptance and approval by the Town of Greenwich.

Such payments will be made by the Town of Greenwich monthly for all services actually rendered, and the acceptance by the Contractor of any such monthly payment shall be a release to the Town of all claims and all liability to the Contractor in connection with the contract, arising during the period for which payment is made. No payment, however, shall operate to release the Contractor or its sureties or insurers from any obligation under the Contract to be entered into or the Performance Bond or any insurance policies issued in connection with said contract.

4. PERFORMANCE MAINTENANCE AND PAYMENT BOND:

The Contractor shall, simultaneously with the signing of the Contract, furnish the Town the executed Performance, Maintenance and Payment Bond of a surety company authorized to do business in the State of Connecticut, and acceptable to the Town, in the sum of the full amount of the Contract obligation in the form provided by the Town.

THE ABOVE IS ONLY REQUIRED FOR CONTRACTS EXCEEDING \$100,000.00.

5. GUARANTEE:

The Contractor guarantees that the Work and services to be performed, furnished, used or installed in the construction of the same, shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, if any, Specifications, and other Contract Documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of completion and acceptance of the Work as stated in the final estimate. The Contractor shall repair, correct or replace as required, promptly and without charge, all work, equipment and material, or parts thereof, which fail to meet the above guarantee or which in any way fail to comply with or fail to be in strict accordance with the terms and provisions and requirements of the Contract during such one-year period, and also shall repair, correct, or replace all damage to the Work resulting from such failure.

6. DEFECTIVE WORK:

The inspection of the Work shall not relieve the Contractor of any of his obligations to perform and complete the Work as required by the Contract. Defective work shall be corrected and unsuitable materials, equipment apparatus and other items shall be replaced by the Contractor, notwithstanding that such work, materials, equipment, apparatus and other items may have been previously overlooked or accepted or estimated for payment. If the work or any part thereof shall be found defective at any time before the final acceptance of the work, the Contractor shall forthwith make good such defect in a manner satisfactory to the Town; if any material, equipment, apparatus or other items brought upon the site for use or incorporation in the work, or selected for the same, is condemned by the Town as unsuitable or not in conformity with the Specifications or any of the other Contract Documents, the Contractor shall forthwith remove such materials, equipment, apparatus and other items from the site of the Work and shall at his own cost and expense make good and replace the same and any material furnished by the Town which shall be damaged or rendered defective by the handling or improper installation by the Contractor, his agents, servants, employees or subcontractors.

7. **COMPLIANCE WITH LAWS:**

The Contractor shall keep himself fully informed of all existing and future federal, state and local laws, ordinances, rules and regulations affecting those engaged or employed on the work, the materials and equipment used in the work or the conduct of the work, and of all orders, decrees and other requirements of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the Drawings, if any, Specifications or other Contract Documents in relation to any such law, ordinance, rule, regulation, order, decree or other requirement, the Contractor shall forthwith report the same to the Town in writing. The Contractor shall at all times observe and comply with, and cause all his agents, servants, employees and subcontractors to observe and comply with all such existing and future laws, ordinances, rules, regulations, orders, decrees and other requirements, and he shall protect, indemnify and save harmless the Town, its officers, agents, servants and employees from and against any and all claims, demands, suits proceedings, liabilities, judgments, penalties, losses, damages costs and expenses, including attorneys' fees, arising from or based upon any violation or claimed violation of any such law, ordinance, rule, regulation, order, decree or other requirement, whether committed by the Contractor or any of his agents, servants, employees or subcontractors.

8. **INDEMNITY:**

The Contractor shall indemnify and save harmless the Town and its officers, agents, servants and employees, from and against any and all claims, demands, suits, proceedings, liabilities, judgments, awards, losses, damages, costs and expenses, including attorneys' fees, on account of bodily injury, sickness, disease or death sustained by any person or persons or injury or damage to or destruction of any property, directly or indirectly arising out of, relating to or in connection with the Work, whether or not due or claimed to be due in whole or in part to the active, passive or concurrent negligence or fault of the Contractor, his officers, agents, servants or employees, any of his subcontractors, the Town any of his respective officers, agents, servants or employees and/or any other person or persons, and whether or not such claims, demands, suits or proceedings are just, unjust, groundless, false or fraudulent; and the Contractor shall and does hereby assume and agrees to pay for the defense of all such claims, demands, suits and proceedings; and provided that the Contractor shall not be required to indemnify the Town, its officers, agents, servants or employees against any such damages occasioned solely by acts or omissions of the Town other than supervisory acts or omissions of the Town in connection with the Work.

9. **INDEMNITY AGAINST SUBCONTRACTORS' CLAIMS:**

If any other contractor or any subcontractor of any such other contractor shall suffer or claim to have suffered loss, damage or delay by reason of the acts or omissions of the Contractor or of any of his subcontractors, the Contractor agrees to assume the defense against any such claim and to reimburse such other contractor or subcontractor for such loss or damage. The Contractor agrees to and does hereby indemnify and save harmless the Town from and against any and all claims by such other contractors or subcontractors, alleging such loss, damage or delay and from and against any and all claims, demands, suits, proceedings, liabilities, judgments, awards, losses, damages, costs and expenses including attorneys' fees, arising out of, relating to or resulting from such claims.

10. **PATENTS:**

The Contractor shall indemnify and save harmless the Town and all persons acting for or on behalf of the Town from all claims and liability of any nature or kind, and all damages, costs and expenses, including attorneys' fees, arising from or occasioned by an infringement or alleged infringement of any patents or patent rights on any invention, process, materials, equipment, article, or apparatus, or any part hereof, furnished and installed by the Contractor, or arising from or occasioned by the use or manufacture thereof, including their use by the Town.

11. **CHANGES:**

The Town, through its designated Agent, may make changes in the Work and in the Drawings, if any, and Specifications therefor by making alterations therein, additions, thereto or omissions therefrom. All work resulting from such changes shall be performed and furnished under and pursuant to the terms and conditions of the Contract. If such changes result in an increase or decrease in the Work to be done hereunder, or increase or decrease the quantities thereof, adjustment in compensation shall be made therefor. For eliminated or decreased work the Contractor shall allow the Town a reasonable credit as determined by the Parties. Except in an emergency endangering life or property, no change shall be made unless in pursuance of a written order from the Town authorizing the change, and no claim for additional compensation shall be valid unless the change is so ordered.

The Contractor agrees that he shall neither have nor assert any claim for or be entitled to any additional compensation for damages or for loss of anticipated profits on work that is eliminated.

12. **CLAIMS FOR DAMAGES:**

If the Contractor makes claim for any damages alleged to have been sustained by breach of contract or otherwise, he shall, within ten (10) days after occurrence of the alleged breach or within ten (10) days after such damages are alleged to have been sustained whichever date is the earlier, file with the Contracting Officer a written, itemized statement of the details of the alleged breach and the details and amount of the alleged damages. The Contractor agrees that unless such statement is made and filed as so required, his claim for damages shall be deemed waived, invalid and unenforceable, and that he shall not be entitled to any compensation for any such alleged damages. Within ten (10) days after the timely filing of such statement, the Contracting Officer shall file with the appropriate department of the Town, one copy of the statement, and shall file with the Town and the Contractor his determination thereon. The Contractor shall not be entitled to claim any additional compensation for damages by reason of any direction, instruction, determination or decision of the Town or its agents, nor shall any such claims be considered, unless the Contractor shall have complied in all respects with the provisions of this paragraph.

13. **ABANDONMENT OF THE WORK OR OTHER DEFAULT:**

If the Work shall be abandoned, or any part thereof shall be sublet without previous written consent of the Town, or the Contract or any moneys payable hereunder shall be assigned otherwise than as herein specified, or if at any time the Contracting Officer shall be of the opinion, and shall so certify in writing, that the conditions herein specified as to rate of progress are not being complied with, or that the Work or any part thereof is being unnecessarily or unreasonably delayed, or that the Contractor has violated or is in default under any of the provisions of the Contract, or if the Contractor becomes bankrupt or insolvent or goes or is put into liquidation or dissolution, either voluntarily or involuntarily, or petitions for an arrangement or reorganization under the Bankruptcy Act, or makes a general assignment for the benefit of creditors or otherwise acknowledges insolvency, the happening of any of which shall be and constitute a default under the Contract, the Town may notify the Contractor in writing, with a copy of such notice mailed to the surety, to discontinue all Work or any part thereof; thereupon the Contractor shall discontinue such Work or such part thereof as the Town may designate; and the Town may, upon giving such notice, by Contract or otherwise as it may determine, complete the Work or such part thereof and charge the entire cost and expense of so completing the work. The Town shall be entitled to reimbursement from the Contractor and the Contractor agrees to pay to the Town any losses, damages, costs and expenses, including attorneys' fees, sustained or incurred by the Town by reason of any of the foregoing causes. For the purpose of such completion the Town may for itself or for any Contractors employed by the Town take possession of and use or cause to be used any and all materials, equipment,

plant, machinery, appliances, tools, supplies and such other items of every description that may be found or located at the site of the Work.

All costs, expenses, losses, damages, attorneys' fees, and any and all other charges incurred by the Town under this subsection shall be charged against the Contractor and deducted and/or paid by the Town out of any moneys due and payable or to become due or payable under the Contract to the Contractor; in computing the amounts chargeable to the Contractor, the Town shall not be held to a basis of the lowest prices for which the completion of the Work or any part thereof might have been accomplished, but all sums actually paid or obligated therefor to effect its prompt completion shall be charged to and against the account of the Contractor. In case the costs, expenses, losses, damages, attorneys' fees and other charges together with all payments theretofore made to or for the account of the Contractor are less than the sum which would have been payable under the Contract if the Work had been properly performed and completed by the Contractor, the Contractor shall be entitled to receive the difference, and, and in case such costs, expenses, losses, damages, attorneys' fees and other charges, together with all payments theretofore made to or for the account of the Contractor, shall exceed the said sum, the Contractor shall pay the amount of the excess to the Town.

14. **LIENS:**

If at any time any notices of lien or other legal process are filed for labor performed or materials or equipment manufactured, furnished, or delivered to or for the Work, the Contractor shall, at its own cost and expense, promptly discharge, remove or otherwise dispose of the same, and until such discharge, removal or disposition, the Town shall have the right to retain from any moneys payable hereunder an amount which, in its sole judgment, it deems necessary to satisfy such liens and pay the costs and expenses, including attorneys' fees, of defending any actions brought to enforce the same, or incurred in connection therewith or by reason thereof.

15. **CLAIMS:**

If at any time there be any evidence of any claims for which the Contractor is or may be liable or responsible hereunder, the Contractor shall promptly settle or otherwise dispose of the same, and until such claims are settled or disposed of, the Town may retain from any moneys which would otherwise be payable hereunder so much thereof as, in its sole judgment, it may deem necessary to settle or otherwise dispose of such claims and to pay the costs and expenses, including attorneys' fees, of defending any actions brought to enforce such claims or incurred in connection therewith or by reason thereof.

16. **LIABILITY OF TOWN:**

No person, firm or corporation, other than the Contractor, who signed this Contract as such, shall have any interest herein or rights hereunder. No claim shall be made or be valid either against the Town or any agent of the Town and neither the Town nor any agent of the Town shall be liable for or be held to pay any money, except as herein provided. The acceptance by the Contractor of the payment as fixed in the final estimate shall operate as and shall be a full and complete release of the Town and of every agent of the Town of and from any and all claims, demands, damages and liabilities of, by or to the Contractor for anything done or furnished for or arising out of or relating to or by reason of the Work or for or on account of any act or neglect of the Town or of any agent of the Town or of any other person, arising out of, relating to or by reason of the Work, except the claim against the Town for the unpaid balance, if any there be, of the amounts retained as herein provided.

17. **PROVISIONS REQUIRED BY LAW DEEMED INSERTED:**

Each and every provision of law and clause 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 they were included herein. 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.

18. **PERMITS:**

The Contractor shall, at his own expense, take out and maintain all necessary permits from the State, Town, or other public authorities; shall give all notices required by law; and shall post all bonds and pay all fees and charges incident to the due and lawful prosecution of the Work.

19. **NOT TO SUBLET OR ASSIGN:**

The Contractor shall constantly give his personal attention to the faithful prosecution of the Work, shall keep the same under his personal control, shall not assign the Contract or sublet the Work or any part thereof without the previous written consent of the Town, and shall not assign any of the moneys payable under the Contract, or his claim thereto, unless by and with the like written consent of the Town and the surety on the Contract Bonds. Any assignment or subletting in violation hereof shall be void and unenforceable.

20. **EMPLOY COMPETENT PEOPLE:**

The Contractor shall employ only competent people on the Work and shall not employ people or means which may cause strikes, work stoppages and/or disturbances by workmen employed by the Contractor, any subcontractor, the Town, the Contracting Officer or any other contractor. Whenever the Contracting Officer notifies the Contractor in writing that in his opinion any person on the Work is incompetent, unfaithful, disorderly, or otherwise unsatisfactory or not employed in accordance with the provisions of the Contract, such person shall be discharged from the Work and shall not again be employed on it, except with the written consent of the Contracting Officer.

21. **EMPLOY SUFFICIENT LABOR AND EQUIPMENT:**

If in the sole judgment of the Contracting Officer the Contractor is not employing sufficient labor, plant, equipment or other means to complete the Work within the time specified, the Contracting Officer may, after giving written notice, require the Contractor to employ such additional labor, plant, equipment and other means as the Contracting Officer deems necessary to enable the Work to progress properly.

22. **INTOXICATING LIQUORS:**

The Contractor shall not sell and shall neither permit nor suffer the introduction or use of intoxicating liquors upon or about the Work.

23. **ACCESS TO WORK:**

The Town, the Contracting Officer, and their officers, agents, servants and employees may at any and all times and for any and all purposes, enter upon the Work and the site thereof and the premises used by the Contractor, and the Contractor shall at all times provide safe and proper facilities therefor.

24. **EXAMINATION OF WORK:**

The Contracting Officer shall be furnished by the Contractor with every reason able facility for examining and inspecting the Work and for ascertaining that the Work is being performed in accordance with the requirements and intent of the Contract, even to the extent of requiring the uncovering or taking down portions of finished work by the Contractor.

25. **EXTRA WORK:**

The Contractor shall perform any extra work (work in connection with the Contract but not provided for herein) when and as ordered in writing by the Contracting Officer, at the unit prices stipulated in the Contract for such work or, if none are so stipulated, either (a) at the price agreed upon before such work is commenced and named in the written order for such work, or (b) if the Contracting Officer so elects, for the reasonable cost of such work, as determined by the Contractor and approved by the Contracting Officer, plus a percentage of such cost, as may be agreed upon by Contract and Contracting Officer.

26. **CHANGES NOT TO AFFECT BONDS:**

It is distinctly agreed and understood that any changes made in the work or the Drawings or Specifications therefor (whether such changes increase or decrease the amount thereof or the time required for its performance) or any changes in the manner or time of payments made by the Town to the Contractor, or any other modifications of the Contract, shall in no way annul, release, diminish or affect the liability of the surety on the Contract Bonds given by the Contractor, it being the intent hereof that notwithstanding such changes the liability of the surety on said bonds continue and remain in full force and effect.

27. **PRICES FOR WORK:**

The Town shall pay and the Contractor shall receive the prices stipulated in the Bid made a part hereof as full compensation for everything performed and furnished and for all risks and obligations undertaken by the Contractor under and as required by the Contract.

28. **MONEYS MAY BE RETAINED:**

The Town may at any time retain from any moneys which would otherwise be payable hereunder so much thereof as the Town may deem necessary to complete the Work hereunder and to reimburse it for all costs, expenses, losses, damage and damages chargeable to the Contractor hereunder.

29. **USE OR PARTIAL PAYMENT NOT ACCEPTANCE:**

It is agreed that this is an entire contract for one whole and complete Work or result and that neither the Town's entrance upon or use of the Work or any part thereof nor any partial payments by the Town shall constitute an acceptance of the Work or any part thereof before its entire completion and final acceptance.

30. **NON-CONNECTICUT CONTRACTORS:**

Pursuant to Connecticut General Statutes §12-430(7), as amended by Connecticut Public Act #11-61, Section 66, a nonresident contractor shall comply with the State of Connecticut's bonding requirements.

31. **PAYMENT TO SUBCONTRACTORS:**

As required by Section 49-41a of the Connecticut General Statutes, within thirty days after payment to the Contractor by the Town for work under this Contract, he shall pay any amounts due any subcontractor, whether for labor performed or materials furnished when such labor or materials has been included in a requisition submitted by such Contractor and paid by the Town.

32. **INSURANCE:**

Insurance coverage required as noted in "Exhibit A" attached.

33. **PREVAILING WAGE RATES; CONSTRUCTION SAFETY AND HEALTH COURSE:**

Except as noted below, the Contractor shall comply with the current provisions of Section 31-53 of the General Statutes of the State of Connecticut, a part of which is quoted as follows:

"The wages paid on an hourly basis to any person performing the work of any mechanic, laborer or worker on the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such person to any employee or welfare fund, as defined in subsection (h) of section 31-53 of the General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer or worker as part of such person's wages the amount of payment or contribution for such person's classification on each pay day."

All Contractors and subcontractors shall submit certified weekly payrolls, on forms furnished by the Town, for all contracts meeting the aforementioned monetary limits. The certified payrolls shall be submitted with the Contractor's monthly certificate for payment.

Section 31-55a of the General Statutes of the State of Connecticut provides that the prevailing wage rates applicable to any awarded contract or subcontract are subject to annual adjustments each July 1st for the duration of the project.

Each Contractor that is awarded a contract shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the Contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's web site. The annual adjustments will be posted on the Department's of Labor web page: www.ctdol.state.ct.us. For those without Internet access, contact the division listed below.

The Contractor shall also furnish proof with the weekly certified payroll for the first week each employee begins work that any person performing the work of a mechanic, laborer or worker has completed a course of at least ten (10) hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration in accordance with Connecticut General Statutes Section 31-53b and regulations adopted by the State of Connecticut Labor Commissioner.

The provisions of this section (32) shall not apply where the total cost of all work to be performed by all Contractors and subcontractors in connection with new construction of any public works project is less than four hundred thousand dollars (\$400,000) or where the total cost of all work to be performed by all contractors and subcontractors in connection with any remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project is less than one hundred thousand dollars (\$100,000).

Questions can be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at 860-263-6790.

34. **GOVERNING LAW:**

The laws of the State of Connecticut shall govern this Contract and any and all litigation related to this Contract. In the event of litigation related to this Contract, the exclusive forum shall be the State of Connecticut and the exclusive venue for such litigation shall be the Judicial District for Stamford/Norwalk at Stamford.

IN WITNESS, WHEREOF, the parties of the AGREEMENT have hereunto set their hand and seals the day first above written.

TOWN OF GREENWICH, CONNECTICUT

BY _____

THE CONTRACTOR

BY _____

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under Owner's separate contracts.
5. Owner-furnished/Contractor-installed (OFICI) products.
6. Contractor's use of site and premises.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.

1.2 PROJECT INFORMATION

A. Project Identification: Cos Cob School Fire Alarm Upgrade.

1. Project Location: 300 E Putnam Avenue, Cos Cob, CT 06807.

B. Owner: Greenwich Public Schools, 290 Greenwich Avenue, Greenwich, CT 06830.

1. Owner's Representative: Dan Watson (Director of School Facilities).
 - a. Phone: 203-625-7450
 - b. Email: daniel_watson@greenwich.k12.ct.us
2. Owner's Representative: Domenick Franco (Construction Foreman)
 - a. Phone: 203-625-7465
 - b. Email: dominick_franco@greenwich.k12.ct.us

C. Engineer: Landmark Facilities Group, Inc., 252 East Avenue, Norwalk, CT 06855.

1. Engineer's Representative: Richard Sileo (Engineer of Record).
 - a. Phone: 203-866-4626 x311
 - b. Email: RSileo@LFGInc.com
2. Engineer's Representative: Lucas Cleary (Electrical Engineer).
 - a. Phone: 203-866-4626 x315
 - b. Email: LCleary@LFGInc.com

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Installation of an optional standby generator power system at an elementary school and other work indicated in the Contract Documents.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.4 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
 - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
 - 2. Provide for delivery of Owner-furnished products to Project site.
 - 3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
 - 4. Obtain manufacturer's inspections, service, and warranties.
 - 5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
 - 1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
 - 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
 - 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
 - 4. Make building services connections for Owner-furnished products.
 - 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
 - 6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFCI) Products:
 - 1. Standby Generator G1-SB.
 - a. 150kW/187.5kVA.
 - b. 208Y/120Vac.
 - c. Natural gas fueled.
 - d. 600A output circuit breaker.
 - e. Rehlko KG150 + 4S13X.
 - 2. Automatic transfer switch ATS-SB.
 - a. 600A.
 - b. 4 Pole.

- c. Asco J03ATSB30600CGXF + 11BE.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways, and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1.7 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 3:30 p.m., Monday through Friday, unless otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Engineer and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.

- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Arrange schedule of values consistent with format of AIA Document G703.
 - 2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - 3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 - 4. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 - 5. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
 - 6. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 - 7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Products list (preliminary if not final).
 - 5. Submittal schedule (preliminary if not final).
 - 6. List of Contractor's staff assignments.
 - 7. List of Contractor's principal consultants.
 - 8. Copies of building permits.
 - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 10. Initial progress report.
 - 11. Report of preconstruction conference.
- G. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- H. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706.
 5. AIA Document G706A.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.

1.2 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.3 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.

3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.4 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Engineer will return without response those RFIs submitted to Engineer by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Owner name.
 2. Owner's Project number.
 3. Name of Engineer.
 4. Engineer's Project number.
 5. Date.
 6. Name of Contractor.
 7. RFI number, numbered sequentially.
 8. RFI subject.
 9. Specification Section number and title and related paragraphs, as appropriate.
 10. Drawing number and detail references, as appropriate.
 11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 13. Contractor's signature.
 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Engineer.
- D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.

- c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Engineer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Engineer.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Engineer's response was received.
- F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

1.5 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Engineer's Digital Data Files: Digital data files of Engineer's CAD drawings will be provided by Engineer for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD 2025 .dwg format.
 4. Contractor shall execute a data licensing agreement in the form of Engineer's data licensing agreement form.
 - a. Subcontractors, and other parties granted access by Contractor to Engineer's digital data files shall execute a data licensing agreement in the form of Engineer's data licensing agreement form..
- B. PDF Document Preparation: Where PDFs are required to be submitted to Engineer, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.
 1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Critical work sequencing and long lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Use of web-based Project software.
 - g. Procedures for processing field decisions and Change Orders.
 - h. Procedures for RFIs.
 - i. Procedures for testing and inspecting.
 - j. Procedures for processing Applications for Payment.
 - k. Distribution of the Contract Documents.
 - l. Submittal procedures.
 - m. Preparation of Record Documents.
 - n. Use of the premises.
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

- C. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Engineer.
 - 4. Name of Contractor.
 - 5. Name of firm or entity that prepared submittal.
 - 6. Names of subcontractor, manufacturer, and supplier.
 - 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 - 8. Category and type of submittal.
 - 9. Submittal purpose and description.

10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Engineer.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package, and transmit to Engineer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Engineer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Resubmittal Review: Allow 7 days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.

- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.
- D. Certificates:
 - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 - 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 - 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- E. Test and Research Reports:
 - 1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
 - 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 - 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 - 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 - 5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
 - 6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.

- g. Limitations of use.

1.7 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.8 ENGINEER'S REVIEW

- A. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Engineer will return without review submittals received from sources other than Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 01 7823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 2. Section 01 7839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Section 01 7900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.
 5. Submit testing, adjusting, and balancing records.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 7 days prior to date the Work will be completed and ready for final inspection and tests.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 01 2900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 7 days prior to date the Work will be completed and ready for final inspection and tests.

1.6 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following formats:
 - a. MS Excel Electronic File: Engineer will return annotated file.
 - b. PDF Electronic File: Engineer will return annotated file.

1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit by email to Engineer.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by 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.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. 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.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - d. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - e. Vacuum and mop concrete.
 - f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - h. Remove labels that are not permanent.
 - i. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - j. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 7300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Manuals for Engineers review: Submit PDFs by email to Engineer. Enable reviewer comments on draft submittals.
 - 2. Final Manual after revisions: Submit PDFs by email to owner and engineer. Submit (3) paper copies of manual in binders to owner.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Final Completion and at least days before commencing demonstration and training. Engineer will return copy with comments.
 - 1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.
- D. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - 2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Engineer.

7. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.5 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Power failure.
 3. System, subsystem, or equipment failure.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Operating instructions for conditions outside normal operating limits.
 3. Required sequences for electric or electronic systems.
 4. Special operating instructions and procedures.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Operating standards.
 - 3. Operating procedures.
 - 4. Operating logs.
 - 5. Wiring diagrams.
 - 6. Control diagrams.
 - 7. Precautions against improper use.
 - 8. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Required sequences for electric or electronic systems.
 - 8. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.
- C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.
- H. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1.8 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Product Information: Include the following, as applicable:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 1. Inspection procedures.
 2. Schedule for routine cleaning and maintenance.
 3. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints.
 - 2) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit Record Digital Data Files.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. 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 provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Revisions to routing of piping and conduits.
 - d. Revisions to electrical circuitry.
 - e. Actual equipment locations.
 - f. Locations of concealed internal utilities.
 - g. Changes made by Change Order or Construction Change Directive.
 - h. Changes made following Engineer's written orders.
 - i. Details not on the original Contract Drawings.
 - j. Field records for variable and concealed conditions.
 - k. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Engineer for resolution.
 4. Engineer will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data 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 digital data file.
4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer.
 - e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 3. Note related Change Orders and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.2 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 7823 "Operation and Maintenance Data."

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Engineer.

1.5 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Operating standards.
 - c. Regulatory requirements.
 - d. Equipment function.
 - e. Operating characteristics.
 - f. Limiting conditions.
 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Routine and normal operating instructions.
 - c. Regulation and control procedures.
 - d. Control sequences.
 - e. Safety procedures.
 - f. Instructions on stopping.
 - g. Normal shutdown instructions.
 - h. Operating procedures for emergencies.
 - i. Operating procedures for system, subsystem, or equipment failure.
 - j. Required sequences for electric or electronic systems.
 - k. Special operating instructions and procedures.
 5. Adjustments: Include the following:
 - a. Alignments.

- b. Checking adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Procedures for routine cleaning.
 - c. Procedures for preventive maintenance.
 - d. Procedures for routine maintenance.
 - e. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 7823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.8 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.
 - 1. Submit video recordings by email to owner.
- B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
- C. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
- D. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

SECTION 07 8413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product data.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.3 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.

- 1) UL in its online directory "Product iQ."
- 2) FM Approvals in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Description: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Building and Construction.
 - b. Hilti, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.
1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
 2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.
1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor. The following floor penetrations do not require a T-rating:
 - a. Those within the cavity of a wall.
 - b. Floor, tub, or shower drains within a concealed space.
 - c. 4-inch or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 FIELD QUALITY CONTROL

- A. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- B. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

SECTION 221413 - BUILDING STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide Facility storm drainage 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. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot head of water (30 kPa).
- 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."

1.3 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. LEED Submittal:
 - 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.
- C. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to building occupied by Edgemont School District or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify the Administrator no fewer than two days in advance of proposed interruption of storm-drainage service.
 - 2. Do not proceed with interruption of storm-drainage service without the Administrator written permission.

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 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. 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.

2.3 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.

2.4 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 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.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground storm drainage piping NPS 6 (DN 150) 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 coupled joints.
 - 3. Steel pipe, drainage fittings, and threaded joints.

3.2 PIPING INSTALLATION

- A. 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."
- B. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. 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.
- C. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Storm Drain: 1 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 Storm-Drainage Piping: 2 percent downward in direction of flow.
- D. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

- E. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports for Plumbing Piping and Equipment. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. 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.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
 - 2. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
 - 3. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
 - 4. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).
- E. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
 - 2. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
 - 3. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
 - 4. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
- G. Install supports for vertical steel piping every 15 feet (4.5 m).

- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to area drains and storm drainage specialties.

3.6 FIELD QUALITY CONTROL

- A. During installation, notify the State of New York at least 24 hours before inspection must be made. Perform tests specified below in presence of the State of New York.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 - 2. Final Inspection: Arrange for final inspection State of New York to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If State of New York 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 the State of New York.
- D. Test storm drainage piping according to procedures of State of New York 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 storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Test Procedure: Test storm drainage 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 (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 5. Prepare reports for tests and required corrective action.

3.7 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 22 14 13

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide Storm drainage piping specialties 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. Cleanouts.
 2. Through-penetration firestop assemblies.
 3. Roof drains.
 4. Miscellaneous storm drainage piping specialties.
 5. Flashing materials.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.4 COORDINATION

- A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 ROOF DRAINS

- A. Metal Area Drains RD-1, RD-2:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawing P-001 or a comparable product by one of the following or approved equal:
 - a. Olympic Manufacturing Group.
 - b. Portals Plus, Inc.
 - c. Thaler Metal Industries Ltd.
 - d. Josam Company; Josam Div.
 - e. Marathon Roofing Products.
 - f. MIFAB, Inc.
 - g. Portals Plus, Inc.
 - h. Prier Products, Inc.
 - i. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - j. Tyler Pipe; Wade Div.
 - k. Watts Drainage Products Inc.
 - l. Zurn Plumbing Products Group; Light Commercial Operation.
 - m. Zurn Plumbing Products Group; Specification Drainage Operation.

- n. LSP Products Group, Inc.
 - o. Marathon Roofing Products.
 - p. Olympic Manufacturing Group.
 - q. Thaler Metal Industries Ltd.
 - r. Thunderbird Products.
-
- 2. Standard: ASME A112.21.2M.
 - 3. Body Material: Cast iron.
 - 4. Dimensions of Body: 15".
 - 5. Combination Flashing Ring and Gravel Stop: Required.
 - 6. Outlet: Bottom.
 - 7. Underdeck Clamp: Required.

2.2 FLASHING MATERIALS

- A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm) thickness.
- B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.
- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- F. Solder: ASTM B 32, lead-free alloy.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install area drains at existing points of roof areas according to roof membrane manufacturer's written installation instructions.
 - 1. Install area-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 - 2. Position roof drains for easy access and maintenance.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

- A. Set flashing on floors and roofs in solid coating of bituminous cement.
- B. Secure flashing into sleeve and specialty clamping ring or device.

3.4 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 22 14 23

SECTION 231123 - FACILITY NATURAL GAS 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. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Service meters.
 - 7. Concrete bases.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, 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.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating Pressure Ratings:
 - 1. Piping and Valves: 125 psig minimum unless otherwise indicated.
 - 2. Service Regulators: 125 psig minimum unless otherwise indicated.
 - 3. Minimum Operating Pressure of Service Meter: 2 psig.
- B. Natural Gas System Pressure within Buildings: 0.5 PSIG but not more than 2 PSIG.
- C. Delegated Design: Design restraints and anchors for Natural Gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using

performance requirements and design criteria indicated, or as approved under requirements of the Fuel Gas Code of this jurisdiction and approving authority.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping specialties.
 - 2. Steel piping, corrugated stainless steel tubing, associated components.
 - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 - 4. Pressure regulators. Indicate pressure ratings and capacities.
 - 5. Service meters. Indicate pressure ratings and capacities. Include bypass fittings and meter bars.
 - 6. Dielectric fittings.
- B. Shop Drawings: For facility Natural Gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
 - 1. Shop Drawing Scale: 1/4 inch per foot.
 - 2. Detail mounting, supports, and valve arrangements for service meter assembly and pressure regulator assembly.
- C. Delegated Design Submittal: For Natural Gas piping and equipment 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 seismic restraints.
 - 2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which Natural Gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Qualification Data: For qualified professional engineer.
- C. Welding certificates.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pressure regulators and service meters to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Steel Support 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.
- C. 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing Natural Gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.10 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural Gas Service: Do not interrupt Natural Gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of Natural Gas supply according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of Natural Gas service.
 - 2. Do not proceed with interruption of Natural Gas service without Owner's written permission.
 - 3. Notify the "Call Before You Dig" hotline prior to excavation to access existing below grade utility information and location.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Wrought steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
 5. Protective Coating for Underground Piping: Factory applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
 6. Mechanical Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dresser Piping Specialties; Division of Dresser, Inc.
 - 2) Smith-Blair, Inc.
 - b. Steel flanges and tube with epoxy finish.
 - c. Buna-nitrile seals.
 - d. Steel bolts, washers, and nuts.
 - e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
- B. Corrugated, Stainless steel Tubing: Comply with ANSI/IAS LC 1.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. OmegaFlex, Inc.
 - b. Parker Hannifin Corporation; Parflex Division.
 - c. Titeflex.
 - d. Tru-Flex Metal Hose Corp.
 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- 1) Flame Spread Index: 25 or less.
- 2) Smoke Developed Index: 50 or less.
4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating Pressure Rating: 5 PSIG (34.5 kPa).

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless steel tubing with polymer coating.
5. Operating Pressure Rating: 0.5 PSIG - 2.0 PSIG.
6. End Fittings: Zinc coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40/60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

C. Quick Disconnect Devices: Comply with ANSI Z21.41.

1. Copper alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

D. Weatherproof Vent Cap: Cast- or malleable iron increaser fitting with corrosion resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
 - 6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.
 - 1. CWP Rating: 125 psig.
 - 2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
 - 3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- D. Bronze Plug Valves: MSS SP-78.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
 - 2. Body: Bronze, complying with ASTM B 584.
 - 3. Plug: Bronze.
 - 4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Operator: Square head or lug type with tamperproof feature where indicated.
 - 6. Pressure Class: 125 psig (862 kPa).

7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for Natural Gas service with "WOG" indicated on valve body.

E. Cast Iron, Non-lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McDonald, A. Y. Mfg. Co.
 - b. Mueller Co.; Gas Products Div.
 - c. Xomox Corporation; a Crane company.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for Natural Gas service with "WOG" indicated on valve body.

F. Cast Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flowserve.
 - b. Homestead Valve; a division of Olson Technologies, Inc.
 - c. McDonald, A. Y. Mfg. Co.
 - d. Milliken Valve Company.
 - e. Mueller Co.; Gas Products Div.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for Natural Gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Meter Company.
 - b. Eclipse Combustion, Inc.
 - c. Fisher Control Valves and Regulators; Division of Emerson Process Management.
 - d. Maxitrol Company.
2. Body and Diaphragm Case: Cast iron or die cast aluminum.
3. Springs: Zink plated steel; interchangeable.
4. Diaphragm Plate: Zink plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet stabilized, mineral filled nylon.
8. Single port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field installed, stainless steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 PSIG (13.8 kPa).

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Corporation; Controls Div.
 - b. Maxitrol Company.
2. Body and Diaphragm Case: Die cast aluminum.
3. Springs: Zink plated steel; interchangeable.
4. Diaphragm Plate: Zink plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet stabilized, mineral filled nylon.
7. Factory applied Finish: Minimum three-layer polyester and polyurethane paint finish.

8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 PSIG (13.8 kPa).

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hart Industries International, Inc.
 - b. Jomar International Ltd.
 - c. Matco-Norca, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 PSIG (860 kPa) minimum at 180 deg F (82 deg C).
 - c. End Connections: Solder joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Matco-Norca, Inc.
 - b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - c. Wilkins; a Zurn company.
2. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 125 PSIG (860 kPa) minimum at 180 deg F (82 deg C).
 - d. End Connections: Solder joint copper alloy and threaded ferrous; threaded Solder joint copper alloy and threaded ferrous.

D. Dielectric Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.

- d. Pipeline Seal and Insulator, Inc.
- 2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.

PART 3 - EXECUTION

3.1 INSTALLATION OF OUTDOOR PIPING

- A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least 24 inches below finished grade and warning tape 12" above pipe route. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
- C. Install underground, PE, natural-gas piping in accordance with ASTM D2513.

3.2 EXAMINATION

- A. Examine roughing-in for Natural Gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect Natural Gas piping according to The State of Connecticut NFPA-54 to determine that Natural Gas utilization devices are turned off in piping section affected.
- C. Comply with The State of Connecticut NFPA-54 requirements for prevention of accidental ignition.

3.4 INDOOR PIPING INSTALLATION

- A. Comply with The State of Connecticut NFPA-54 for installation and purging of Natural Gas piping guidelines.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.

- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install Natural Gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to allow removal plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Concealed Location Installations: Except as specified below, install concealed Natural Gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. Above Accessible Ceilings: Natural Gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
 - 2. In Floors: Install Natural Gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum

- of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install Natural Gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
 4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
 - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 5. Prohibited Locations:
 - a. Do not install Natural Gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install Natural Gas piping in solid walls or partitions.
 - c. Do not install Natural Gas piping in egress corridors.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use Natural Gas piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."
- W. 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."
- X. 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."
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless steel tubing, corrugated aluminum tubing, or copper connector.
- B. Install underground valves with valve boxes.

- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install anode for metallic valves in underground PE piping.
- E. Do not install valves in return-air plenums.

3.6 PIPING 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. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. 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. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for Natural Gas service. Install gasket concentrically positioned.
- G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not over tighten.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

- C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches ; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.
- D. Install hangers for horizontal, corrugated stainless steel tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
 - 3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install Natural Gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Fuel Gas Code section "401.5 Identification".
- B. Install detectable warning tape directly above underground gas piping 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping is to be the following:
 - 1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
 - 2. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.11 PAINTING

- A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior Natural Gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel semigloss or gloss.
 - d. Color: Gray.
- C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components with factory applied paint or protective coating.
 - 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (low sheen) or (semigloss).
 - d. Color: Gray.
 - 2. Alkyd System: MPI INT 5.1E.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (flat) or (semigloss).
 - d. Color: Gray.
- D. Damage and Touchup: Repair marred and damaged factory applied finishes with materials and by procedures to match original factory finish.

3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to The State of Connecticut local code and authorities having jurisdiction.
- C. Natural Gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.13 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.
- B. Aboveground Natural Gas piping shall be one of the following:
 - 1. Steel pipe with malleable iron fittings and threaded joints.
 - 2. Steel pipe with wrought steel fittings and welded joints.
- C. Containment Conduit: Steel pipe with wrought steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:
 - 1. Corrugated stainless steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Aluminum tube with flared fittings and joints.
 - 3. Steel pipe with malleable iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable iron fittings and threaded joints.
 - 2. Steel pipe with wrought steel fittings and welded joints.
- C. Containment Conduit: Steel pipe with wrought steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- D. Containment Conduit Vent Piping: Steel pipe with malleable iron fittings and threaded or wrought steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.15 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 2 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:
 - 1. Corrugated stainless steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Aluminum tube with flared fittings and joints.
 - 3. Steel pipe with malleable iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable iron fittings and threaded joints.
 - 2. Steel pipe with steel welding fittings and welded joints.

- C. Containment Conduit: Steel pipe with wrought steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.
- D. Containment Conduit Vent Piping: Steel pipe with malleable iron fittings and threaded or wrought steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.16 BELOWGRADE MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. See "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
 - 1. Tamperproof Feature: Locking feature for valves indicated in "Underground, Manual Gas Shutoff Valve Schedule" articles.

3.17 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:
 - 1. Bronze plug valve.
- B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:
 - 1. Bronze plug valve.
 - 2. Cast Iron, non-lubricated plug valve.
- C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
 - 1. Bronze plug valve.
- D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be one of the following:
 - 1. Bronze plug valve.
 - 2. Cast Iron, non-lubricated plug valve.
- E. Valves in branch piping for single appliance shall be of the following:
 - 1. Bronze plug valve.

END OF SECTION 231123

SECTION 235123 - GAS VENTS

PART 1 - GENERAL

1.1 SCOPE

- A. This Section includes specifications for furnishing and installing factory-built Engine Exhaust Systems.

1.2 SUBMITTALS

- A. Catalog cuts
- B. Sizing calculations
- C. Installation drawings
- D. Installation instructions
- E. Sample of extended warranty

1.3 QUALITY ASSURANCE

A. APPLICABLE STANDARDS

- I. All products furnished under this Section shall conform to the requirements of NFPA 37 and NFPA 211 for exhaust gas temperatures not exceeding 1400°F. Products shall be listed to UL 103 positive pressure tested and listed to 60" w.c.; and shall carry the appropriate UL and cUL listing mark or label.
- II. Engine exhaust system shall be listed as suitable for an internal maximum static pressure rating of 60" w.c.

B. WARRANTY

The Engine Exhaust System shall be warranted by the manufacturer against defects in material and workmanship for a period of one (1) year, with the option of an extended twelve (12) years, from the date of original installation. Any portion of the exhaust system repaired or replaced under warranty shall be warranted for the remainder of the original warranty period.

PART 2 - PRODUCTS

2.1 ENGINE EXHAUST SYSTEM

- A. The exhaust pipe sections shall be constructed of an inner wall and an outer wall with 1 inch ceramic fiber insulation between the walls.

The inner wall shall be constructed of .035" thick type 304 stainless steel for diameters 6" through 36".

The outer wall shall be constructed of type 304 stainless steel, .024" thick for all sizes.

Inner and outer walls shall be connected by means of spacer clips, which maintain the concentricity of the annular space and allow unobstructed, differential thermal expansion of inner and outer walls.

- B. *All exhaust pipe parts exposed to the weather shall be 304 stainless steel.*

- C. All supports, drains, roof penetrations, terminations, flange adapters, and fittings required to install the exhaust pipe shall be included. Lined bellows joints shall be used to compensate for expansion. Provide relief valve where indicated on plans.

- D. All inner pipe joints shall include a 1/2" flange and shall be held together by means of formed vee bands and sealed with P071 High Temperature Ceramic Sealant. Flanged ends of the pipe shall incorporate 1" long sleeve on one end to create a male/female joint.

Where exposed to weather, the outer casing bands shall be sealed with clear silicone to prevent rainwater from entering the space between the inner and outer walls.

- E. Screws shall be of the hex-head type with shoulder stops and tapered "lead-in" threads for easy starting.

Nuts for the inner and outer bands shall be retained by means of a free-floating cage to allow easy alignment.

Seal clips should be used in conjunction with inner vee flange bands on diameters 6 to 10 inch.

- F. The exhaust system shall terminate 2 feet above the roof parapet wall or as required by local codes.

2.2 AVAILABLE MANUFACTURERS

The Exhaust System shall be Model IPIC Insulated Pressure Industrial Chimney as manufactured by Metal-Fab, Inc.

PART 3 - EXECUTION

- A. Store delivered materials inside out of the weather. Protect materials from accidental damage or vandalism.
- B. Installation shall conform to the manufacturer's installation instructions, UL listing and state or local codes.
- C. Support exhaust system from building structure using rigid structural shapes for attachment of fixed point supports (Plate Support Assembly). Anchor supports to structure by welding, bolting, steel expansion anchors, or concrete inserts. Size of structural shapes shall be in accordance with manufacturer's recommendations.
- D. Protect incomplete chimney installations by attaching temporary closures over open ends of sections.
- E. Clean all exhaust system sections of dust and debris prior to final connection to appliances.
- F. Installation shall conform to manufacturers' installation instructions.

SECTION 26 0010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AIC: Ampere interrupting capacity.
6. AL, Al, or ALUM: Aluminum.
7. ASD: Adjustable-speed drive.
8. ATS: Automatic transfer switch.
9. AWG: American wire gauge; see ASTM B258.
10. BAS: Building automation system.
11. BIL: Basic impulse insulation level.
12. BIM: Building information modeling.
13. CAD: Computer-aided design or drafting.
14. CATV: Community antenna television.
15. CB: Circuit breaker.
16. cd: Candela, the SI fundamental unit of luminous intensity.
17. CO/ALR: Copper-aluminum, revised.
18. COPS: Critical operations power system.
19. CU or Cu: Copper.
20. CU-AL or AL-CU: Copper-aluminum.
21. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
22. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
23. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
24. dBm: Decibel absolute power with respect to 1 mW.
25. DC or dc: Direct current.
26. DCOA: Designated critical operations area.
27. DDC: Direct digital control (HVAC).
28. EGC: Equipment grounding conductor.
29. ELV: Extra-low voltage.

- 30. EMF: Electromotive force.
- 31. EMI: Electromagnetic interference.
- 32. EPM: Electrical preventive maintenance.
- 33. EPS: Emergency power supply.
- 34. EPSS: Emergency power supply system.
- 35. ESS: Energy storage system.
- 36. EV: Electric vehicle.
- 37. EVPE: Electric vehicle power export equipment.
- 38. EVSE: Electric vehicle supply equipment.
- 39. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
- 40. FLC: Full-load current.
- 41. ft: Foot.
- 42. ft-cd: Foot-candle, the antiquated U.S. Standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" after the SI unit candela (cd) replaced the international candle; see "fc,"
- 43. GEC: Grounding electrode conductor.
- 44. GFCI: Ground-fault circuit interrupter.
- 45. GFPE: Ground-fault protection of equipment.
- 46. GND: Ground.
- 47. HACR: Heating, air conditioning, and refrigeration.
- 48. HDPE: High-density polyethylene.
- 49. HID: High-intensity discharge.
- 50. HP or hp: Horsepower.
- 51. HVAC: Heating, ventilating, and air conditioning.
- 52. Hz: Hertz.
- 53. IBT: Intersystem bonding termination.
- 54. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
- 55. IP: Ingress protection rating (enclosures); Internet protocol (communications).
- 56. IR: Infrared.
- 57. IS: Intrinsically safe.
- 58. IT&R: Inspecting, testing, and repair.
- 59. ITE: Information technology equipment.
- 60. kAIC: Kiloampere interrupting capacity.
- 61. kmil or MCM: One thousand circular mils.
- 62. kV: Kilovolt.
- 63. kVA: Kilovolt-ampere.
- 64. kVAr or kVAR: Kilovolt-ampere reactive.
- 65. kW: Kilowatt.
- 66. kWh: Kilowatt-hour.
- 67. LAN: Local area network.
- 68. lb: Pound (weight).
- 69. lbf: Pound (force).
- 70. LCD: Liquid-crystal display.
- 71. LCDI: Leakage-current detector-interrupter.
- 72. LED: Light-emitting diode.
- 73. Li-ion: Lithium-ion.
- 74. lm: Lumen, the SI derived unit of luminous flux.

- 75. LNG: Liquefied natural gas.
- 76. LP-Gas: Liquefied petroleum gas.
- 77. LRC: Locked-rotor current.
- 78. LV: Low voltage.
- 79. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
- 80. m: Meter.
- 81. MCC: Motor-control center.
- 82. MDC: Modular data center.
- 83. MG set: Motor-generator set.
- 84. MIDI: Musical instrument digital interface.
- 85. MLO: Main lugs only.
- 86. MV: Medium voltage.
- 87. MVA: Megavolt-ampere.
- 88. mW: Milliwatt.
- 89. MW: Megawatt.
- 90. MWh: Megawatt-hour.
- 91. NC: Normally closed.
- 92. Ni-Cd: Nickel-cadmium.
- 93. Ni-MH: Nickel-metal hydride.
- 94. NIU: Network interface unit.
- 95. NO: Normally open.
- 96. NPT: National (American) standard pipe taper.
- 97. OCPD: Overcurrent protective device.
- 98. ONT: Optical network terminal.
- 99. PC: Personal computer.
- 100. PCS: Power conversion system.
- 101. PCU: Power-conditioning unit.
- 102. PF or pf: Power factor.
- 103. PHEV: Plug-in hybrid electric vehicle.
- 104. PLC: Programmable logic controller.
- 105. PLFA: Power-limited fire alarm.
- 106. PoE: Power over Ethernet.
- 107. PV: Photovoltaic.
- 108. PVC: Polyvinyl chloride.
- 109. pW: Picowatt.
- 110. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
- 111. RMS or rms: Root-mean-square.
- 112. RPM or rpm: Revolutions per minute.
- 113. SCADA: Supervisory control and data acquisition.
- 114. SCR: Silicon-controlled rectifier.
- 115. SPD: Surge protective device.
- 116. sq.: Square.
- 117. SWD: Switching duty.
- 118. TCP/IP: Transmission control protocol/Internet protocol.
- 119. TEFC: Totally enclosed fan-cooled.
- 120. TR: Tamper resistant.
- 121. TVSS: Transient voltage surge suppressor.
- 122. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
- 123. UL CCN: UL Category Control Number.
- 124. UPS: Uninterruptible power supply.
- 125. USB: Universal serial bus.

- 126. UV: Ultraviolet.
- 127. V: Volt, unit of electromotive force.
- 128. V(ac): Volt, alternating current.
- 129. V(dc): Volt, direct current.
- 130. VA: Volt-ampere, unit of complex electrical power.
- 131. VAR: Volt-ampere reactive, unit of reactive electrical power.
- 132. VFC: Variable-frequency controller.
- 133. VOM: Volt-ohm-multimeter.
- 134. VPN: Virtual private network.
- 135. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
- 136. W: Watt, unit of real electrical power.
- 137. Wh: Watt-hour, unit of electrical energy usage.
- 138. WPT: Wireless power transfer.
- 139. WPTE: Wireless power transfer equipment.
- 140. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

- 1. EMT: Electrical metallic tubing.
- 2. EMT-A: Aluminum electrical metallic tubing.
- 3. EMT-S: Steel electrical metallic tubing.
- 4. EMT-SS: Stainless steel electrical metallic tubing.
- 5. ENT: Electrical nonmetallic tubing.
- 6. EPEC: Electrical HDPE underground conduit.
- 7. EPEC-40: Schedule 40 electrical HDPE underground conduit.
- 8. EPEC-80: Schedule 80 electrical HDPE underground conduit.
- 9. EPEC-A: Type A electrical HDPE underground conduit.
- 10. EPEC-B: Type B electrical HDPE underground conduit.
- 11. ERMC: Electrical rigid metal conduit.
- 12. ERMC-A: Aluminum electrical rigid metal conduit.
- 13. ERMC-S: Steel electrical rigid metal conduit.
- 14. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
- 15. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
- 16. ERMC-SS: Stainless steel electrical rigid metal conduit.
- 17. FMC: Flexible metal conduit.
- 18. FMC-A: Aluminum flexible metal conduit.
- 19. FMC-S: Steel flexible metal conduit.
- 20. FMT: Steel flexible metallic tubing.
- 21. FNMC: Flexible nonmetallic conduit. See "LFNC."
- 22. HDPE: See EPEC.
- 23. IMC: Steel electrical intermediate metal conduit.
- 24. LFMC: Liquidtight flexible metal conduit.
- 25. LFMC-A: Aluminum liquidtight flexible metal conduit.
- 26. LFMC-S: Steel liquidtight flexible metal conduit.
- 27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
- 28. LFNC: Liquidtight flexible nonmetallic conduit.
- 29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
- 30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
- 31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
- 32. PVC: Rigid PVC conduit.

33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERM-C-S-G.
38. RMC: See ERM-C.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-HL: Metal-clad cable, hazardous location.
31. MI: Mineral-insulated, metal-sheathed cable.
32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.

- 33. MV: Medium-voltage cable.
- 34. NM: Nonmetallic sheathed cable.
- 35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
- 36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
- 37. NPLF: Non-power-limited fire-alarm circuit cable.
- 38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
- 39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
- 40. NUCC: Nonmetallic underground conduit with conductors.
- 41. OFC: Conductive optical fiber general-purpose cable.
- 42. OFCG: Conductive optical fiber general-purpose cable.
- 43. OFCP: Conductive optical fiber plenum cable.
- 44. OFCR: Conductive optical fiber riser cable.
- 45. OFN: Nonconductive optical fiber general-purpose cable.
- 46. OFNG: Nonconductive optical fiber general-purpose cable.
- 47. OFNP: Nonconductive optical fiber plenum cable.
- 48. OFNR: Nonconductive optical fiber riser cable.
- 49. P: Marine shipboard cable.
- 50. PLTC: Power-limited tray cable.
- 51. PLTC-ER: Power-limited tray cable, exposed run.
- 52. PV: Photovoltaic cable.
- 53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
- 54. RHW: Thermoset rubber, moisture-resistant cable.
- 55. SA: Silicone rubber cable.
- 56. SE: Service-entrance cable.
- 57. SER: Service-entrance cable, round.
- 58. SEU: Service-entrance cable, flat.
- 59. SIS: Thermoset cable for switchboard and switchgear wiring.
- 60. TBS: Thermoplastic cable with outer braid.
- 61. TC: Tray cable.
- 62. TC-ER: Tray cable, exposed run.
- 63. TC-ER-HL: Tray cable, exposed run, hazardous location.
- 64. THW: Thermoplastic, heat- and moisture-resistant cable.
- 65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
- 66. THHW: Thermoplastic, heat- and moisture-resistant cable.
- 67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
- 68. TW: Thermoplastic, moisture-resistant cable.
- 69. UF: Underground feeder and branch-circuit cable.
- 70. USE: Underground service-entrance cable.
- 71. XHH: Cross-linked polyethylene, heat-resistant cable.
- 72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Definitions:

- 1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted-pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
 - a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.

2. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
3. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
4. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
5. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
6. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
7. Designated Seismic System: A system component that requires design in accordance with Chapter 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
8. Direct Buried: Installed underground without encasement in concrete or other protective material.
9. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
 - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 - b. Concrete Box: A box intended for use in poured concrete.
 - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
 - e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
 - f. Device Box: A box with provisions for mounting a wiring device directly to the box.
 - g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
 - h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
 - i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
 - j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-

- mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
- k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 - l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
 - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
 - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
 - o. Raised-Floor Box: A floor box intended for use in raised floors.
 - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
 - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
 - r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
 - s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
 - t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
10. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
11. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
12. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
- a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
13. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

14. Jacket: A continuous nonmetallic outer covering for conductors or cables.
15. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
16. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
17. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
18. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
19. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
20. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
21. Sheath: A continuous metallic covering for conductors or cables.
22. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
23. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
 - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
 - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
 - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
 - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
 - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
24. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

1.3 COORDINATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
 - 1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.
 - 3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
 - a. Exercising generators.
 - b. Emergency lighting.
 - c. Elevators.
 - d. Fire-alarm systems.

1.4 PREINSTALLATION MEETINGS

- A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than 15 days after notice to proceed. Agenda topics include, but are not limited to, the following:
 - 1. Electrical installation schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
 - 1. Submission of action submittals specified in Division 26.
 - 2. Orders placed for major electrical equipment.
 - 3. Arrival of major electrical equipment on-site.
 - 4. Preinstallation meetings specified in Division 26.
 - 5. Utility service outages.
 - 6. Utility service inspection and activation.
 - 7. Closing of walls and ceilings containing electrical Work.
 - 8. System startup, testing, and commissioning activities for major electrical equipment.
 - 9. Requests for special inspections.
 - 10. Requests for inspections by authorities having jurisdiction.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device listed below:

- a. Fire Alarm System.
 - b. Area of Rescue Assistance Phone System.
- 2. Include the following information:
 - a. Manufacturer's operating specifications.
 - b. User's guides for software and hardware.
 - c. Schedule of maintenance material items recommended to be stored at Project site.
 - d. Detailed instructions covering operation under both normal and abnormal conditions.
 - e. Manufacturer's instructions for setting field-adjustable components.
 - f. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
 - g. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
- B. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:
 - 1. Software operating and upgrade manuals.
 - 2. Names, versions, and website addresses for locations of installed software.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.
- C. Software:
 - 1. Program Software Backup: Provide username and password for approved online or cloud solution.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
 - 1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

END OF SECTION

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. 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. Cerro Wire LLC.
 2. Encore Wire Corporation.
 3. General Cable; Prysmian Group North America.
 4. 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.
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.
 2. 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. Belden Inc.
 - 4. Cerro Wire LLC.
 - 5. Encore Wire Corporation
 - 6. General Cable; Prysmian Group North America.
 - 7. 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.
- 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 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. Ideal Industries, Inc.
 6. NSi Industries LLC.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper.
 2. Type: One hole with standard barrels.
 3. Termination: Compression.

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.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

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 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.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

3.5 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.

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Grounding (earthing) electrodes.

B. Related Requirements:

1. Section 26 0010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 26 0011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product indicated.

B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control" Article, including the following:

1. Test wells.
2. Rod electrodes.
3. Ring electrodes.
4. Grounding arrangements and connections for separately derived systems.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. In addition to items specified in Section 26 0010 "Supplemental Requirements for Electrical," include the following:
 - a. Plans showing locations of grounding features described in "Field Quality Control" Article, including the following:
 - 1) Test wells.
 - 2) Rod electrodes.
 - 3) Ring electrodes.
 - 4) Grounding arrangements and connections for separately derived systems.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ERICO; brand of nVent Electrical plc.
 - b. Harger Lightning & Grounding; business of Harger, Inc.
2. Referenced Standards: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3
 - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
 - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
 - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

C. UL KDER - Armored Grounding Wire:

1. Description: Single corrosion-resistant copper, aluminum, or copper-clad aluminum conductor within helically formed steel armor.
2. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Southwire Company, LLC.
3. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 4. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2.2 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications; see Section 27 0526 "Grounding and Bonding for Communications Systems," for selection and installation guidelines.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- C. UL KDER and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. ERICO; brand of nVent Electrical plc.
 - e. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - f. Harger Lightning & Grounding; business of Harger, Inc.
 - g. ILSCO; brand of ECM Industries LLC; division of nVent Electric plc.
 - h. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - i. Panduit Corp.
 - j. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 2. General Characteristics:
 - a. Two pieces with zinc-plated bolts.
 - b. Clamp Material: Silicon bronze.

- c. Listed for outdoor use.

D. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. ERICO; brand of nVent Electrical plc.
 - e. Harger Lightning & Grounding; business of Harger, Inc.
 - f. ILSCO; brand of ECM Industries LLC; division of nVent Electric plc.
 - g. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - h. Panduit Corp.
 - i. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
2. General Characteristics:
 - a. Clamp Material: Bronze.
 - b. Listed for outdoor use.

E. UL KDER - Beam Grounding and Bonding Clamp:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Anderson; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - c. Panduit Corp.
2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

F. UL KDER - Exothermically Welded Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. ERICO; brand of nVent Electrical plc.
 - d. Harger Lightning & Grounding; business of Harger, Inc.
2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Bonding Bushing:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 2. General Characteristics: Threaded bushing with insulated throat.
- D. UL KDER - Grounding Bushing:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.

B. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Grounding and Bonding Hub:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
- 2. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

A. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

B. UL KDER - Pressure-Type Grounding and Bonding Busbar Cable Connector:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. General Characteristics: Copper or copper alloy, for compression bonding of one or more conductor directly to copper busbar. Listed for direct burial.
- C. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Harger Lightning & Grounding; business of Harger, Inc.
 - c. ILSCO; brand of ECM Industries LLC; division of nVent Electric plc.
 2. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.
- D. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. ILSCO; brand of ECM Industries LLC; division of nVent Electric plc.
 2. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.
 - a. Copper alloy, C and H shaped.
- E. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. ERICO; brand of nVent Electrical plc.
 2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.
 - a. Copper alloy.

2.6 GROUNDING (EARTHING) ELECTRODES

- A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.
- B. Performance Criteria:
1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Rod Electrode:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. ERICO; brand of nVent Electrical plc.
 - c. Harger Lightning & Grounding; business of Harger, Inc.
 2. General Characteristics: Copper-clad steel; 3/4 inch by 10 ft.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF BUSBARS

- A. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 1. Install bus horizontally, on insulated spacers 2 inch minimum from wall, 6 inch 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.

3.3 SELECTION OF GROUNDING AND BONDING CONDUCTORS

- A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
- B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
- C. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
- D. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
- E. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
- F. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
- G. Underground Grounding Conductors: Install barecopper conductor, 2/0 AWG minimum.
 - 1. Bury at least 30 inch below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

3.4 SELECTION OF CONNECTORS

- A. 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.

3.5 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 - 1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
 - 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
 - 1. Conductors:

- a. 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.
2. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - b. Make connections with clean, bare metal at points of contact.
 - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
 - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - f. 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 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 disconnect-type connection is required, use bolted clamp.
 - g. 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 bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where 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 bolted connector.
 - 3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
3. Electrodes:
 - a. Ground Rods: Drive rods until tops are 2 inch 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.

- 2) Use exothermic welds for below-grade connections.
 - b. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 0543 "Underground Ducts and Raceways for Electrical Systems," and must be at least 12 inch deep, with cover.
 - 1) Install at least one test well for each service unless otherwise indicated. Install at ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
 - c. Ring Electrode: Install grounding conductor, electrically connected to each building structure ground rod and to each indicated item, extending around perimeter of area or item indicated.
 - 1) Install tinned-copper conductor not less than 2/0 AWG for ring electrode and for taps to building steel.
 - d. Concrete-Encased Electrode (Ufer Ground):
 - 1) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.
4. Grounding Separately Derived Systems:
 - a. Generator: Install grounding electrode(s) at generator location. Electrode must be connected to equipment grounding conductor and to frame of generator.
5. Equipment Grounding:
 - a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. 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.
 - 8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 9) X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
 - c. 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.

- d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
 - e. Isolated Grounding Receptacle Circuits: Install insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
 - f. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
 - g. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
 - h. Metallic Fences: Comply with requirements of IEEE C2.
 - 1) Grounding Conductor: Bare copper, not less than 8 AWG.
 - 2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
 - 3) Barbed Wire: Strands must be bonded to grounding conductor.
6. Fence Grounding: Install at maximum intervals of 1500 ft except as follows:
- a. Fences within 100 ft of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 ft.
 - 1) Gates and Other Fence Openings: Ground fence on each side of opening.
 - a) Bond metal gates to gate posts.
 - b) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use 2 AWG wire and bury it at least 18 inch below finished grade.
 - b. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at maximum distance of 150 ft on each side of crossing.
 - c. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inch below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.
 - d. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

3.6 FIELD QUALITY CONTROL

A. 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 calibrated torque wrench in accordance with manufacturer's published instructions.
 3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by 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 in accordance with IEEE Std 81.
 - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
 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 record of tests and observations. Include 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.
- B. Nonconforming Work:
1. Grounding system will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective components and retest.
- C. Collect, assemble, and submit test and inspection reports.
1. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω .
 - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 Ω .
 - c. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 Ω .

3.7 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

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. Structural steel for fabricated supports and restraints.
4. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

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. 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 - GENARAL

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 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 ERM-C-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-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 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 DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DZYR; including UL 651.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DZYZ - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB Electrification Installations Products.
 - b. Calconduit; Atkore International.
 - c. JM Eagle.
 - d. NAPCO; Westlake Chemical Corp.
 - e. National Pipe and Plastic, Inc. (Oldcastle).
 - f. Topaz Lighting & Electric.
 2. Dimensional Specifications: Schedule 40.
 3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

2.7 FITTINGS FOR CONDUIT, TUBING, AND CABLE

- A. Fittings for Type ERM, 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. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DWTT; including UL 514B.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

2.9 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.

2.10 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.

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. Indoors:
 - 1. Exposed and Subject to Physical Damage: IMC or ERM. Raceway locations include the following:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - 2. Exposed, Not Subject to Physical Damage: EMT.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Damp or Wet Locations: ERM or IMC.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC or LFMC.
- C. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
 1. ERM 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. 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.

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. 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.
3. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
4. Support conduit within 12 inch of enclosures to which attached.
5. 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.
6. 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.
7. Do not install raceways or electrical items on "explosion-relief" walls or rotating equipment.
8. 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.
9. 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.
10. 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 ERM 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.

D. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. EMT: Provide setscrew, steel fittings. Comply with NEMA FB 2.10.
2. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

E. Expansion-Joint Fittings:

1. Install in runs of aboveground ERMFC 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 0.000078 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.

3.4 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. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
- J. 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.
- K. 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.

3.5 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

3.7 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.

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. 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 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 direct-buried duct bank unless otherwise indicated.

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 3 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.
 - 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 24 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 12 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.

- 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 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.

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

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.

PRODUCTS

1.3 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.

1.4 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. Color for Neutral: White.
 - 4. Color for Equipment Grounds: Green.
 - 5. 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 Sign: "DANGER – STANDBY GENERATOR AUTOMATICALLY STARTS DURING POWER OUTAGE. TYPE OF GENERATOR _____. GENERATOR LOCATION _____."
- 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.

1.5 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.

1.6 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.

1.7 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. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

1.8 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.

1.9 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. 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.

1.10 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.

1.11 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.

EXECUTION

1.12 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. Verify identity of each item before installing identification products.
- C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- F. 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.
- G. 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.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- J. 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.
- K. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

- L. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- M. 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.
- N. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- Q. 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.
- R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- T. Write-on Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using UV-stabilized cable ties.
- U. 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.
- V. 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.

W. 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.

X. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

1.13 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. 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.

- I. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- J. Operating Instruction Signs: Self-adhesive labels.
- K. 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. Motor-starting study.
4. Arc-flash hazard study.
5. 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.
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.

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. 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.

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 one-arc-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

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. ABB, Electrification Business.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 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. ABB, Electrification Business.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 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.
- F. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 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. 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. 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.
- B. 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. 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.
- B. 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. 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.
- B. 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 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. 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.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

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.

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.

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.
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 167 deg F (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. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- J. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
 2. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

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).
- C. 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.

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. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Owner's written permission.
 - 4. Comply with NFPA 70E.
- B. 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.
- C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

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. 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."

B. 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.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D. 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 26 3213.16 - GAS-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes packaged engine generators for non-emergency use with the following features:
 - 1. Natural gas engine.
 - 2. Gaseous fuel system.
 - 3. Control and monitoring.
 - 4. Generator overcurrent and fault protection.
 - 5. Generator, exciter, and voltage regulator.
 - 6. Vibration isolation devices.
- B. Related Requirements:
 - 1. Section 26 3600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.2 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, products provided by the following:
 - 1. Rehlko.

- B. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.
- C. The generator will be furnished by owner and installed by the contractor. Refer to drawings and section 01 1000 – Summary.

2.2 GASEOUS FUEL SYSTEM

- A. Natural Gas Piping: Comply with requirements in Section 23 1123 "Facility Natural Gas Piping."
- B. Gas Train: Comply with NFPA 37.
- C. Engine Fuel System:
- D. Natural Gas, Vapor-Withdrawal System:
 - 1. Carburetor.
 - 2. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.
 - 3. Fuel Filters: One for each fuel type.
 - 4. Manual Fuel Shutoff Valves: One for each fuel type.
 - 5. Flexible Fuel Connectors: Minimum one for each fuel connection.

2.3 VIBRATION ISOLATION DEVICES

- A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
 - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 - 2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of 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. Minimum Deflection: 1 inch.
- B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

PART 3 - EXECUTION

3.1 INSTALLATION

- 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 Owner no fewer than two working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.
- B. Comply with NECA 1 and NECA 404.
- C. Comply with packaged engine generator manufacturers' written installation and alignment instructions.
- D. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases.
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
 - 3. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on 4-inch-high concrete base. Secure engine generator to anchor bolts installed in concrete bases.
- E. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- F. Exhaust System: Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
 - 1. Install flexible connectors and steel piping materials according to requirements in Section 23 5123 "Gas Vents."
- G. Drain Piping: Install condensate drain piping to muffler drain outlet with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe, the full size of the drain connection, with welded joints.
- H. Gaseous Fuel Piping:
 - 1. Natural gas piping, valves, and specialties for gas distribution are specified in Section 23 1123 "Facility Natural Gas Piping."
- I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- C. Connect engine exhaust pipe to engine with flexible connector.
- D. Gaseous Fuel Connections:
 - 1. Connect fuel piping to engines with a gate valve and union and flexible connector.
 - 2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.
 - 3. Vent gas pressure regulators outside building a minimum of 60 inches from building openings.
- E. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.
- G. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.3 IDENTIFICATION

- A. Identify system components according to and Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.
 - a. Visual and Mechanical Inspection
 - 1) Compare equipment nameplate data with drawings and specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect anchorage, alignment, and grounding.

- 4) Verify the unit is clean.
- b. Electrical and Mechanical Tests
 - 1) Perform insulation-resistance tests in accordance with IEEE 43.
 - a) Machines larger than 200 hp. Test duration shall be 10 minutes. Calculate polarization index.
 - b) Machines 200 hp or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.
 - 2) Test protective relay devices.
 - 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 5) Verify correct functioning of the governor and regulator.
2. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
3. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
4. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
- D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
- F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- H. Remove and replace malfunctioning units and retest as specified above.

- I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 26 3600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes automatic transfer switches rated 600 V and less.

1.2 INFORMATIONAL SUBMITTALS

- A. Source quality control reports.
- B. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCHES

- A. Manufacturers: Subject to compliance with requirements, products provided by the following:
 - 1. ASCO Power Technologies.
- B. The automatic transfer switch will be furnished by owner and installed by the contractor. Refer to drawings and section 01 1000 – Summary.
- C.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identify components according to Section 26 0553 "Identification for Electrical Systems."
- B. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- C. Comply with NECA 1.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.
 - 1. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
- E. Route and brace conductors according to manufacturer's written instructions and Section 26 0529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.
- F. Final connections to equipment shall be made with flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with Drawings and Specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and required clearances.
 - d. Verify that the unit is clean.
 - e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - f. Verify that manual transfer warnings are attached and visible.
 - g. Verify tightness of all control connections.
 - h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
 - 1) Use of low-resistance ohmmeter.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
 - i. Perform manual transfer operation.
 - j. Verify positive mechanical interlocking between normal and alternate sources.

- k. Perform visual and mechanical inspection of surge arresters.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
- 2. Electrical Tests:
 - a. Perform insulation-resistance tests on all control wiring with respect to ground.
 - b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
 - c. Verify settings and operation of control devices.
 - d. Calibrate and set all relays and timers.
 - e. Verify phase rotation, phasing, and synchronized operation.
 - f. Perform automatic transfer tests.
 - g. Verify correct operation and timing of the following functions:
 - 1) Normal source voltage-sensing and frequency-sensing relays.
 - 2) Engine start sequence.
 - 3) Time delay on transfer.
 - 4) Alternative source voltage-sensing and frequency-sensing relays.
 - 5) Automatic transfer operation.
 - 6) Interlocks and limit switch function.
 - 7) Time delay and retransfer on normal power restoration.
 - 8) Engine cool-down and shutdown feature.
- 3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
- 4. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
 - b. Verify time-delay settings.
 - c. Verify pickup and dropout voltages by data readout or inspection of control settings.

- d. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- B. Coordinate tests with tests of generator and run them concurrently.
- C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- D. Transfer switches will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
- B. Coordinate this training with that for generator equipment.

END OF SECTION

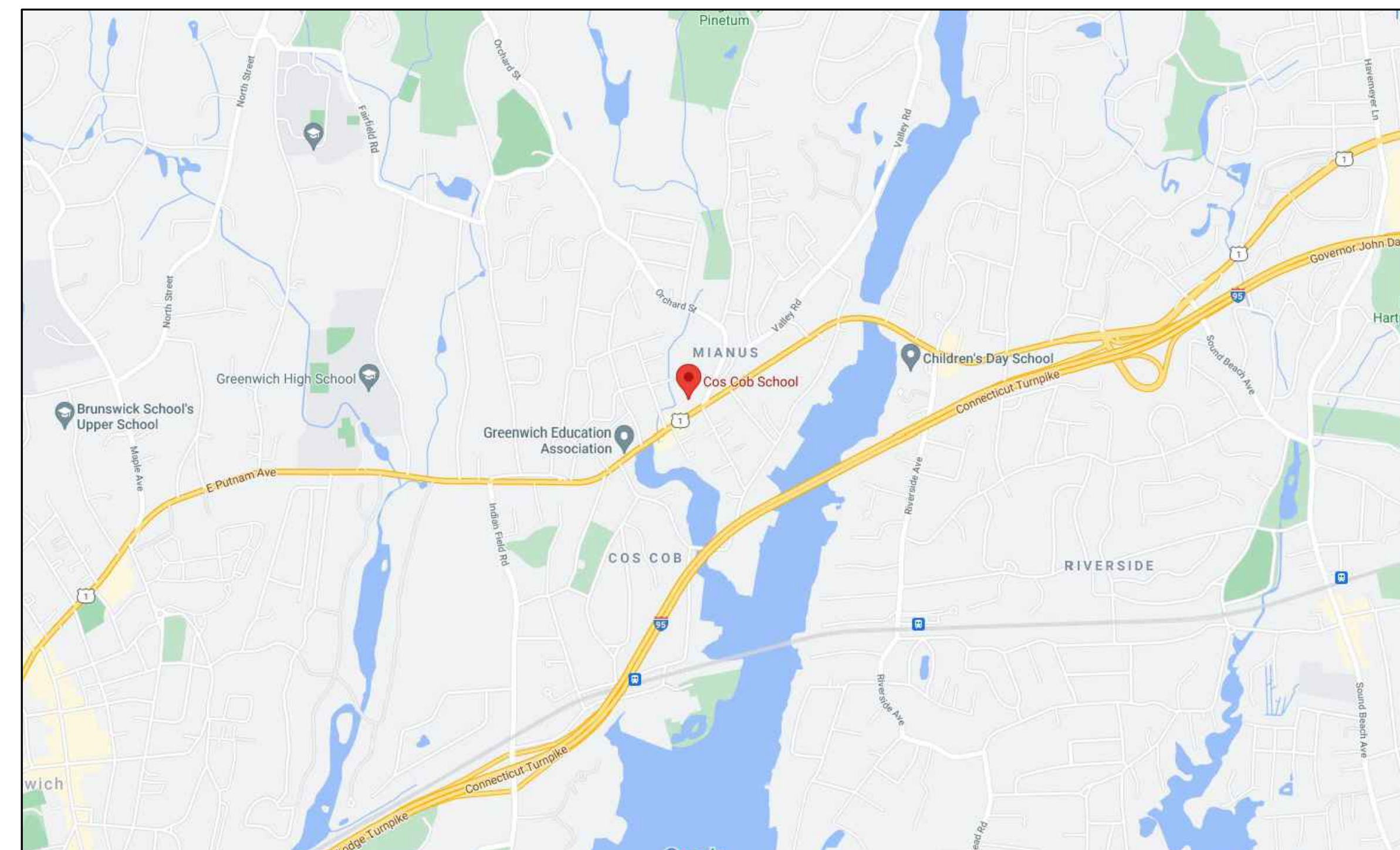


STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

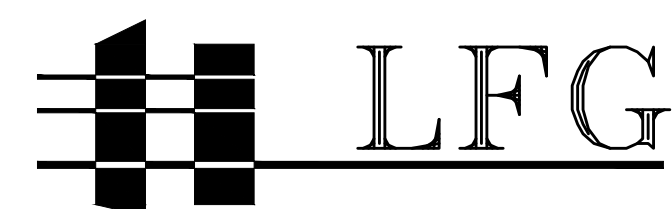
ISSUE: FOR BID

DATE: JUNE 25, 2025

BID # 2534-25



DOCUMENTS PREPARED BY:



252 East Avenue
Norwalk, CT 06855
(203) 866-4626 Tel
(203) 866-8019 Fax

LANDMARK
FACILITIES
GROUP, INC.

[illegible]

DRAWING INDEX	
T-001	COVER SHEET
T-002	PROJECT NOTES AND DESCRIPTION
P-001	PLUMBING NOTES, DETAILS, LEGEND, AND SYMBOLS
P-002	PLUMBING DETAILS
P-101	PLUMBING FIRST FLOOR AND SECOND FLOOR ROOF PART PLANS
E-001	ELECTRICAL LEGEND, NOTES, & ABBREVIATIONS
E-100	FIRST FLOOR ELECTRICAL POWER PLAN - SOUTH
E-101	FIRST FLOOR ELECTRICAL POWER PLAN - NORTH
E-102	SECOND FLOOR ELECTRICAL POWER PLAN
E-103	THIRD FLOOR AND MECHANICAL PENTHOUSES ELECTRICAL POWER PLANS
ER-110	ENLARGED FIRST FLOOR ELECTRICAL POWER REMOVALS PLAN
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ER-200	REMOVALS ONE LINE DIAGRAM
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E-201	ELECTRICAL GROUNDING DIAGRAM
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E-400	ELECTRICAL PANEL SCHEDULES
E-401	ELECTRICAL PANEL SCHEDULES
E-402	ELECTRICAL SCHEDULES

1. THE PRIMARY INTENT OF THIS PROJECT IS TO INSTALL A STANDBY GENERATOR THAT HAS BEEN PRE-PURCHASED BY THE OWNER.

2. THE CONTRACTOR SHALL PROVIDE "TURNKEY" SERVICES WHICH INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING SCOPE ITEMS:

- DEMOLITION OF EXISTING SYSTEM AS INDICATED
- INSTALLATION OF GENERATOR
- INSTALLATION OF AUTOMATIC TRANSFER SWITCH
- PROVISION OF NEW PANEL
- PROVISION OF CONDUCTORS, CABLES, AND RACEWAYS
- PROVISION OF GROUNDING SYSTEM
- SITE WORK, TRENCHING, AND RESTORATION
- GENERATOR RIGGING
- GENERATOR PAD
- ROUTE NEW PIPING FROM EXISTING NATURAL GAS FEED IN EXISTING BOILER ROOM TO OUTDOORS.
- FURNISH AND INSTALL NEW PIPING FROM MECHANICAL ROOM EXTERIOR WALL LEADING TO NEW GAS GENERATOR BELOW GRADE.
- INSPECT FOR PRESSURE AND PURGE ALL NEW AND EXISTING CONNECTED GAS PIPING PER 2021 NFPA-54 CHAPTER 8.
- FURNISH AND INSTALL NEW EXHAUST FLUE.
- TEMPORARY AND PERMANENT FENCING
- FIRE STOPPING
- PAINT & PATCH
- EQUIPMENT IDENTIFICATION
- PERMITS & INSPECTIONS
- OWNER TRAINING
- ENGINEER WITNESSED SYSTEM TESTING WITH SUBMITTED RECORDS
- CLOSEOUT DOCUMENTATION

THE GENERATOR G1-SB AND THE AUTOMATIC TRANSFER SWITCH ATS-SB HAVE BEEN PRE-PURCHASED BY THE OWNER. THE CONTRACTOR SHALL NOT INCLUDE THE PRICE OF THEIR PURCHASE IN THEIR BID. THE CONTRACTOR SHALL INCLUDE ALL COSTS FOR THE INSTALLATION OF THE GENERATOR AND ATS. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE OWNER AND THE VENDOR THE GENERATOR WAS PURCHASED FROM. CONTRACTOR SHALL BE RESPONSIBLE FOR RIGGING OF THE GENERATOR FROM THE DELIVERY TRUCK.

1. ALL BIDDERS SHALL VISIT PROJECT SITE TO THOROUGHLY FAMILIARIZE THEMSELVES WITH EXISTING CONDITIONS. CLAIMS FOR EXTRA PAYMENTS FOR WORK, WHICH COULD HAVE BEEN IDENTIFIED VIA CAREFUL SITE INSPECTION, WILL NOT BE ACKNOWLEDGED.
2. THE CONTRACTORS SHALL PATCH AND PAINT WHERE EQUIPMENT IS REMOVED.
3. CONTRACTOR SHALL PROVIDE REPLACEMENT CEILING TILES IF DAMAGED BY CONTRACTORS WORK. CONTRACTOR SHALL PROVIDE ARMSTRONG CEILINGS MODEL BF507A.
4. CONTRACTOR SHALL CAUSE ALL INSPECTIONS FOR APPROVAL AND SIGNOFF.

UNRESTRICTED WORK SHALL HAPPEN DURING THE SCHOOL'S RECESS. THE BUILDING WILL REMAIN OCCUPIED DURING RECESSES BY CUSTODIAL STAFF DURING NORMAL BUSINESS HOURS.

WORK THAT IS OUTSIDE OF STAFF AND STUDENT OCCUPIED AREAS IS PERMITTED WHILE SCHOOL IS IN SESSION. CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FROM OWNER PRIOR TO PERFORMING ANY WORK WHILE SCHOOL IS IN SESSION. CONTRACTOR SHALL MINIMIZE DISRUPTIONS (NOISE, DUST, VIBRATION, ETC.) TO STAFF AND STUDENTS WHILE SCHOOL IS IN SESSION.

CONSTRUCTION START DATE: AUGUST 08, 2025
TENTATIVE SCHOOL RECESSES (UNRESTRICTED WORK PERIODS):
AUGUST 08, 2025 - AUGUST 22, 2025
DECEMBER 24, 2025 - JANUARY 02, 2026
FEBRUARY 09, 2026 - FEBRUARY 13, 2026
APRIL 03, 2026 - APRIL 10, 2026
JUNE 29, 2026 - AUGUST 21, 2026

SUBSTANTIAL COMPLETION: AUGUST 21, 2026 (TENTATIVE, SHALL BE THE WEEK DAY BEFORE STAFF RETURN TO SCHOOL AS APPROVED BY THE BOARD OF ED.)

FINAL COMPLETION: DECEMBER 31, 2026

OPTION TO EXTEND: JUNE 30, 2027 (AS APPROVED BY THE BOARD OF ED.)

ALL WORK PERIODS ARE SUBJECT TO CHANGE BY THE OWNER.

WORKING HOURS ARE:
7AM TO 5PM DURING THE SCHOOL SUMMER RECESS AND HOLIDAY RECESS
7AM TO 3:30PM WHILE SCHOOL IS IN SESSION IN AREAS NOT OCCUPIED BY STAFF AND STUDENTS

1. THE CONTRACTOR SHALL PERFORM A LIVE LOAD TEST OF THE GENERATOR AND ASSOCIATED SYSTEMS.
2. ENGINEER & OWNER SHALL WITNESS ALL SYSTEM TESTING & INSPECTION.
3. CONTRACTOR SHALL SUBMIT DOCUMENTATION OF SYSTEM TESTING & INSPECTIONS TO ENGINEER FOR RECORD ON NFPA STANDARD FORMS.

1. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL PREPARE EQUIPMENT SUBMITTALS & SHOP DRAWINGS PER SPECIFICATIONS AND SUBMIT TO DESIGN ENGINEER FOR REVIEW AND APPROVAL.
2. UPON COMPLETION OF WORK, CONTRACTOR SHALL SUBMIT PDFs OF AS-BUILT DRAWINGS TO THE ENGINEER FOR REVIEW AND APPROVAL. AS-BUILT DRAWINGS SHALL REFLECT THE ACTUAL INSTALLED FIELD CONDITIONS.
3. PROVIDE NO LESS THAN (2) HARD COPIES AND DIGITAL PDF COPY OF OPERATION AND MAINTENANCE MANUALS AT PROJECT CLOSEOUT. SUBMIT FOR ENGINEER REVIEW PRIOR TO SUBMISSION OF HARD COPIES TO OWNER.
4. ALL SYSTEM TEST RECORDS SHALL BE DOCUMENTED ON A NFPA OR AIA STANDARD FORM AND SUBMITTED TO ENGINEER FOR RECORD.
5. COPIES OF CAD FILES (.DWG) OF BID DRAWINGS ARE AVAILABLE UPON REQUEST TO CONTRACTOR PROVIDED CONTRACTOR SIGNS ENGINEERS RELEASE FORM. CONTRACTOR MAY USE THESE FOR PREPARATION OF SHOP AND AS-BUILT DRAWINGS.

1. ALL BMS WORK SHALL BE SUB-CONTRACTED TO THE SCHOOL DISTRICT'S A/C PROVIDER:

CONNECTICUT TEMPERATURE CONTROLS, LLC.
ATTN: MIKE SULLO
800-890-2022

THIS INCLUDES PROVISION OF BOILER ROOM BMS PANEL UPS, PROGRAMMING OF LOAD STAGING IN BMS, CONTROL WIRING FROM ATS-SB TO BMS PANEL. INCLUDE ALL NECESSARY BMS CONTROL PANEL UPGRADES TO ACCOMPLISH THE ADDITIONAL INPUT AND PROGRAMMING.

THE CONTRACTOR SHALL FIRE PROOF ALL PENETRATIONS THROUGH FIRE RATED WALLS, SLABS, AND ASSEMBLIES, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

1 HOUR FIRE RATED:
ALL CORRIDOR WALLS

2 HOUR FIRE RATED:
BOILER ROOM WALLS
STAIRWELL WALLS
1ST FLOOR FIRE AREA DEMISING WALL
ASSEMBLY SPACE WALLS

3 HOUR FIRE RATED:
ALL SLABS SEPARATING FLOORS

	06-25-2025	ISSUED FOR BID
	06-06-2023	ISSUED FOR PROGRESS
REV	DATE	DESCRIPTION

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: N.T.S.	APPROVED BY: RS	DRAWN BY: LC
DATE: June 25, 2025		CHECKED BY: EL

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: T-002
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PROJECT DESCRIPTION

1. THE PRIMARY INTENT OF THIS PROJECT IS TO INSTALL A NEW GAS FIRED GENERATOR.
2. THE CONTRACTOR SHALL PROVIDE "TURNKEY" SERVICES WHICH INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING SCOPE ITEMS:
- PERFORM ALL SITE WORK INCLUDING EXCAVATION, BEDDING, AND BACKFILL FOR BURIED PIPING.
 - REMOVAL AND REINSTALLATION OF PAVERS.
 - INSTALL NEW PIPING FROM POINT OF CONNECTION IN EXISTING BOILER ROOM.
 - INSPECT, TEST PRESSURE AND PURGE ALL NEW AND EXISTING CONNECTED GAS PIPING PER 2021 NFPA-54 CHAPTER 8.
 - FURNISH AND INSTALL NEW EXHAUST VENT PIPING AS SHOWN.
3. CONTRACTOR SHALL PULL ALL PERMITS AT CONTRACTORS EXPENSE AND CAUSE ALL INSPECTIONS FOR APPROVAL AND SIGNOFF.
4. SCHEDULE FOR ALL WORK SHALL BE COORDINATED WITH OWNER SO AS NOT TO DISRUPT GAS SUPPLY TO BOILERS AND KITCHEN APPLIANCES COOKING OPERATIONS. CONSULT WITH GREENWICH, CT COS COB PUBLIC SCHOOL BUILDING SUPERVISOR FOR FURTHER INFORMATION. ADDITIONAL TIME WILL BE GRANTED FOR SITE WORK ON BUILDING EXTERIOR. PROVIDE NO LESS THAN 72 HOURS ADVANCE NOTICE FOR ALL SHUTDOWNS.
5. THE CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR TO BOND ALL NG PIPING WITHIN OR ATTACHED TO THE BUILDING TO THE WIRE EQUIPMENT GROUNDING CONDUCTOR FOR THE LARGEST AMPACITY CIRCUIT ASSOCIATED WITH THE BOILERS. IF A WIRE EQUIPMENT GROUNDING CONDUCTOR IS NOT PRESENT CONTRACTOR SHALL EITHER INSTALL A WIRE EQUIPMENT GROUNDING CONDUCTOR OR BOND TO THE GROUNDED CONDUCTOR AT THE SERVICE. THE BONDING CONDUCTOR, BONDING JUMPER AND EQUIPMENT GROUNDING CONDUCTOR SHALL BE SIZED PER NEC TABLE 250.122 USING THE RATING OF THE LARGEST AMPACITY CIRCUIT ASSOCIATED WITH THE BOILERS. ALL WORK SHALL BE PERFORMED IN STRICT COMPLIANCE WITH THE NATIONAL ELECTRIC CODE (NFPA 70-2020) AS ADOPTED BY THE STATED OF CONNECTICUT.

PLUMBING GENERAL NOTES

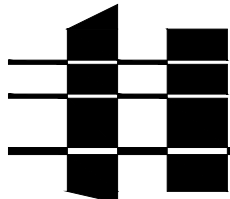
1. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO ALL DRAWINGS MARKED P.
2. DRAWINGS ARE DIAGRAMMATIC: DETERMINE LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.
3. NEITHER ACCURACY NOR COMPLETION OF UTILITY LOCATIONS SHOWN ON DRAWINGS IS GUARANTEED. DETERMINE EXACT LOCATIONS OF EXISTING UTILITIES IN FIELD, WHETHER OR NOT SHOWN ON DRAWINGS. EXERCISE CAUTION AND IDENTIFY LOCATIONS OF UNMARKED UTILITY LINES AS NECESSARY TO PERFORM WORK OF THIS SECTION.
4. ALL PLUMBING WORK SHALL BE IN ACCORDANCE WITH THE CURRENT PLUMBING CODE AND ALL APPLICABLE LOCAL CODES AND DRAWINGS.
5. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE HIS WORK WITH THAT OF ALL OTHER TRADES, INCLUDING (BUT NOT LIMITED TO), ELECTRICAL, HVAC PROCESS PIPING, SPRINKLER, PLUMBING STRUCTURAL AND GENERAL ARCHITECTURE.
6. ANY INTERFERENCE SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND THE OWNER'S REPRESENTATIVE, AND SHALL BE RESOLVED PRIOR TO THE INSTALLATION OF THE WORK INVOLVED.
7. NO WORK SHALL BE INSTALLED IN VIOLATION OF ANY GOVERNING CODES. ANY WORK SHOWN ON THE DRAWINGS WHICH IS IN VIOLATION OF SUCH CODES SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND THE OWNER'S REPRESENTATIVE AND SHALL BE RESOLVED PRIOR TO THE INSTALLATION OF THE WORK INVOLVED.
8. ALL PIPING PENETRATING CEILING AND WALLS SHALL BE INSTALLED WITH FIRE PENETRATION SEALANT EQUAL OF GREATER THAN RATED STRUCTURE PENETRATION. IN ADDITION TO CHROME (STAINLESS WHERE NOTED) PLATED ESCUTCHEONS AT THE PENETRATION.
9. ALL PIPING PENETRATING EXTERIOR WALLS SHALL BE FLASHED IN AN APPROVED MANNER AND SHALL BE SEALED WEATHER TIGHT. PIPING PENETRATING RATED PARTITIONS OR ENVELOPES SHALL BE PROTECTED AS REQUIRED BY LOCAL CODE AUTHORITY. (SEE DETAILS)
10. EQUIPMENT INSTALLATION SHALL ADHERE TO MANUFACTURERS' RECOMMENDATIONS.
11. PROVIDE APPROVED GAS COCKS ON ALL MAJOR BRANCH PIPING AND ON ALL SUPPLIES TO INDIVIDUAL EQUIPMENT.
12. ALL CORE DRILLING OF CONCRETE FLOORS AND WALLS SHALL BE BY THIS CONTRACTOR.
13. CONCRETE PADS AND PLATFORMS FOR WORK OF THIS SECTION WILL BE PROVIDED BY GENERAL CONTRACTOR. PROVIDE INFORMATION AND HARDWARE AS NECESSARY TO COORDINATE WORK.
14. SCHEDULE WORK OF THIS SECTION TO AVOID INTERFERENCE WITH FIRE-PROOFING WORK.
15. PRIOR TO ANY DIGGING OR TRENCHING, CALL '811' AND ARRANGE FOR MARK-OUT BY UTILITY COMPANIES.

PLUMBING SYMBOL LIST

SYMBOL	NOTE: NOT ALL SYMBOLS ARE USED
	DESCRIPTION
---	EXISTING PIPING TO REMAIN
////	EXISTING TO BE REMOVED
--- GAS ---	EXISTING GAS PIPING
--- GAS ---	GAS PIPING
↓	GAS SHUT OFF VALVE
⌵	GAS REGULATOR
○	PIPE RISE OR UP THRU SLAB
⊖	PIPE DROP OR DOWN THRU SLAB
⊖	BOTTOM OF PIPE TAKE-OFF CONNECTION
⌒	TOP OF PIPE TAKE-OFF CONNECTION
⋈	UNION
└	CAP PIPE OUTLET
⦿	POINT OF NEW CONNECTION

PLUMBING ABBREVIATION LIST

SYMBOL	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
ADA	HANDICAPPED ACCESSIBLE
CO	CLEANOUT
CV	CHECK VALVE
CW	COLD WATER
CLG	CEILING
CONN	CONNECT
CONT	CONTINUATION
DN	DOWN (PENETRATES FLOOR SLAB)
DR	DRAIN
DPCO	DECK PLATE CLEANOUT
DWG	DRAWING
EX	EXISTING
EL	ELEVATION
EW2	ELECTRIC WATER COOLER – HANDICAPPED ACCESSIBLE
F1 or F2	FLOOR DRAIN
FL	FLOOR
HWR	HOT WATER RECIRCULATION
IW	INDIRECT WASTE
L1 or L2	LAVATORY
LPG	LIQUEFIED PETROLEUM GAS
LV	LAVATORIES
MIN	MINIMUM
MTD	MOUNTED
NTS	NOT TO SCALE
N	NEW
S	SANITARY
SH2	SHOWER
K2	SINK
TYP	TYPICAL
UP	UP (PENETRATES FLOOR SLAB)
U1 or U2	URINAL
V or VNT	VENT
VIF	VERIFY IN FIELD
W	WASTE
W1, W2, or W3	WATER CLOSET
WCO	WALL CLEANOUT
WH	WATER HEATER



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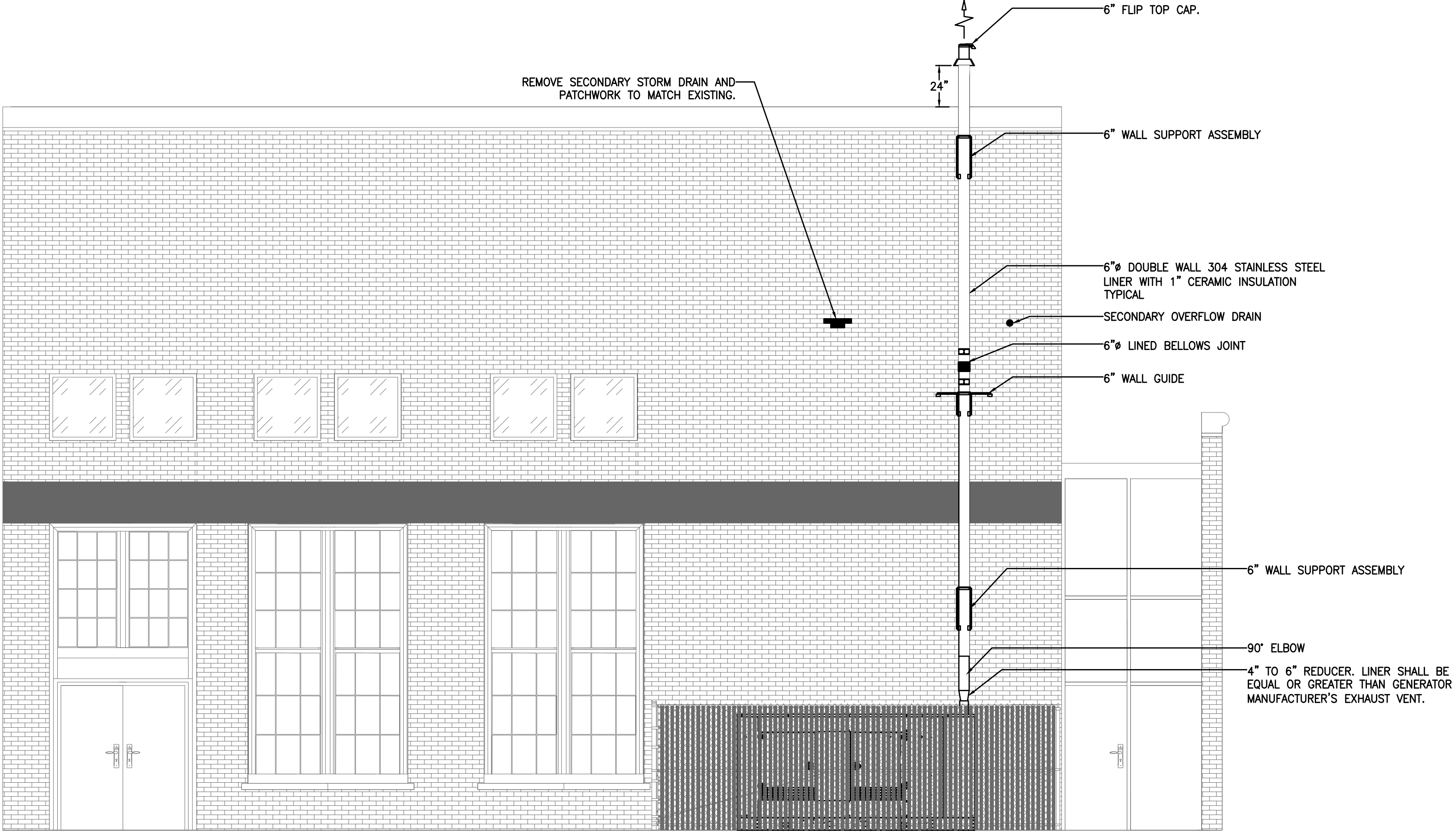
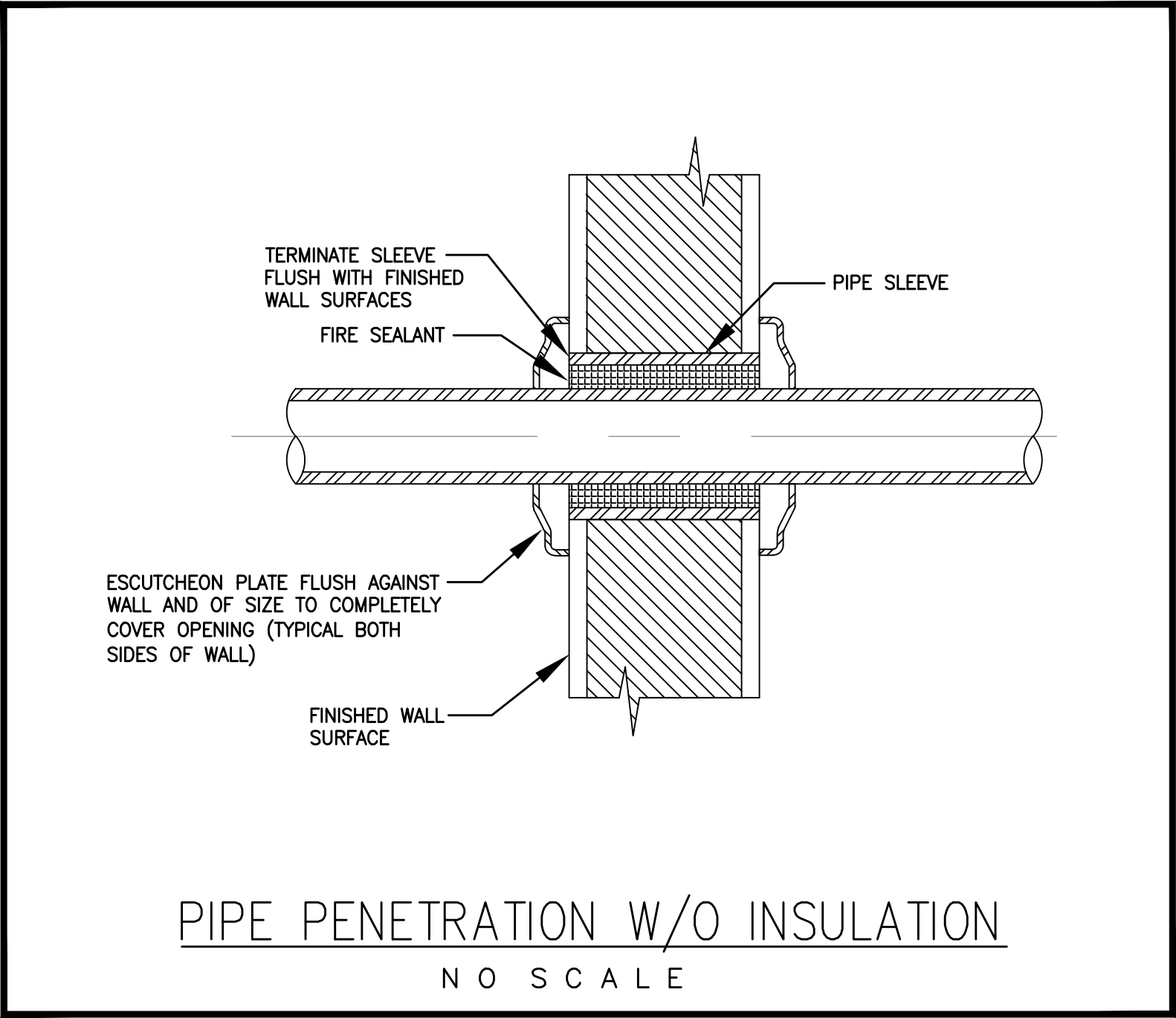
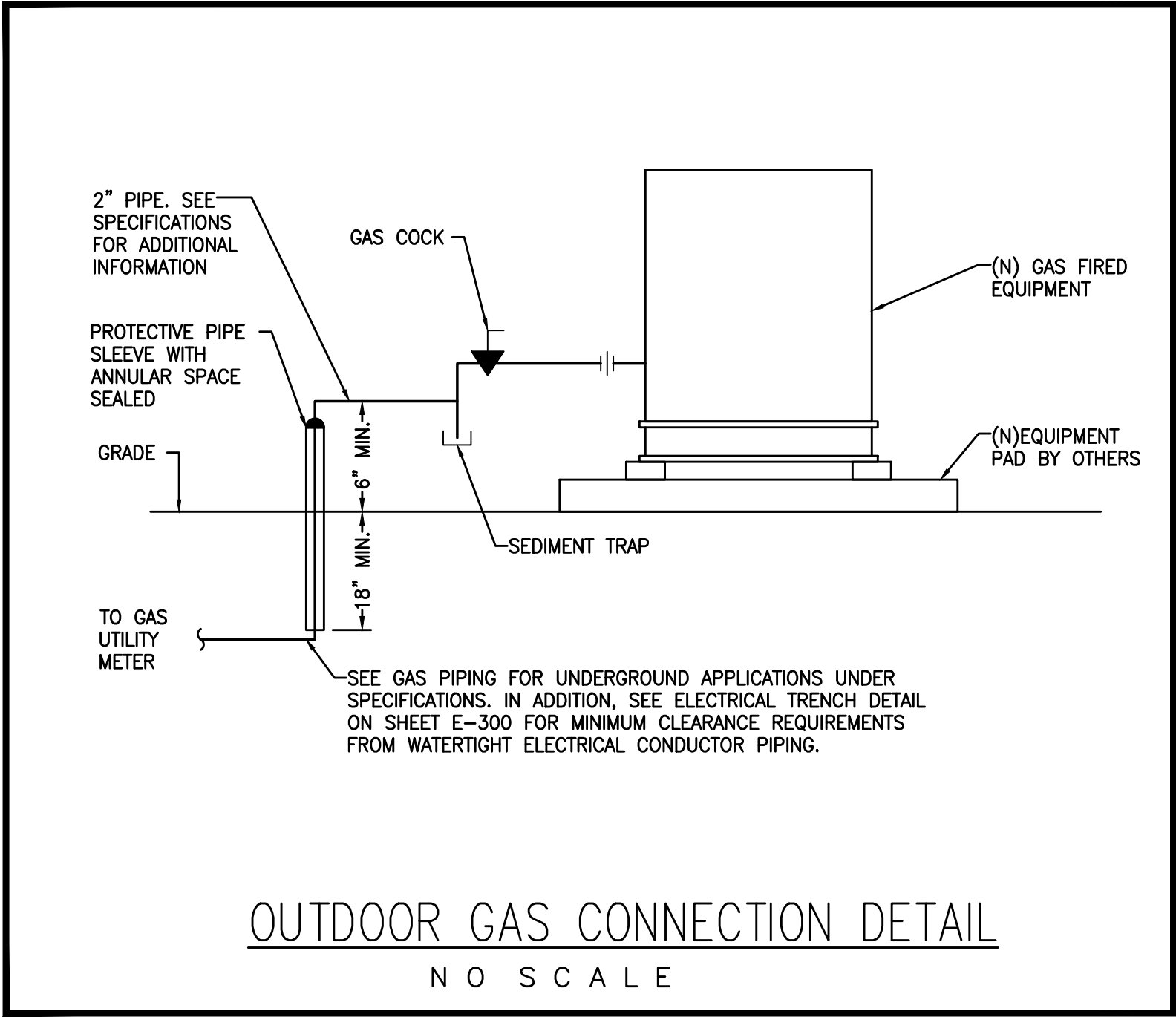
STANDBY GENERATOR
INSTALLATION AT COS
COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: AS NOTED	APPROVED BY: RS	DRAWN BY: LFG
DATE: June 25, 2025		CHECKED BY: EL

PLUMBING NOTES, DETAILS,
LEGEND, AND SYMBOLS

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025LFG-0025	DRAWING NUMBER: P-001
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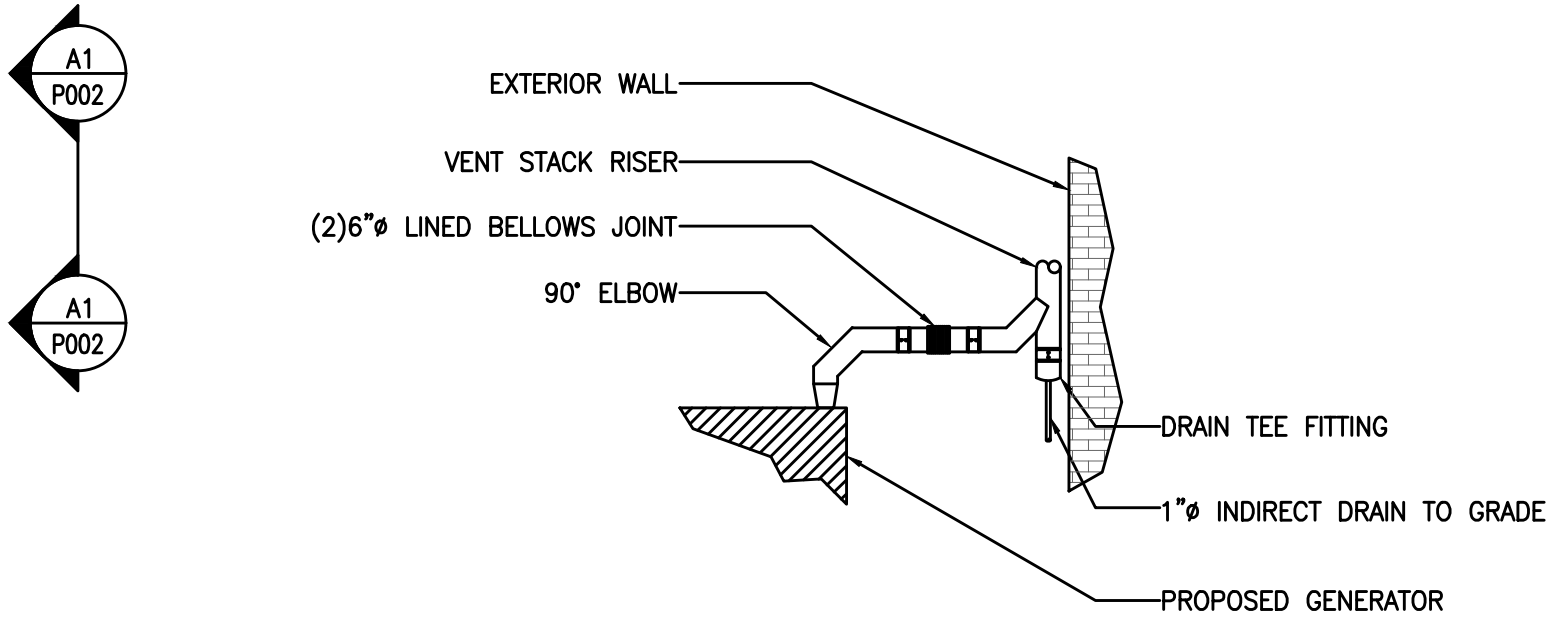
NOTES:
EXHAUST VENT BY METAL FAB MODEL IPIC-1 OR EQUAL.

A DRAIN SHALL BE PROVIDED AT THE LOWEST PORTION OF THE EXHAUST SYSTEM WHERE AN ACCUMULATION OF CONDENSATE AND/OR RAIN MAY ENTER.

PROVIDE AND INSTALL BELLOWS JOINTS HAVING A MINIMUM EXPANSION OF 5" OR MORE FOR THERMAL EXPANSION.

PROVIDE AND INSTALL AN EXHAUST RELIEF VENT TO AVOID DAMAGE IN THE EVENT OF AN EXPLOSION.

PROVIDE POSITIVE PITCH TO THE OUTSIDE OF BUILDING BOTH WITH THE RELOCATED PIPE AND THE HOLE THROUGH THE EXTERIOR WALL. EXTEND PIPE ~2" FROM EXTERIOR FACE OF WALL. CAULK AND SEAL AROUND ALL OPENINGS/PENETRATIONS INSIDE AND OUTSIDE AND MAKE WATERTIGHT. FINISH ALL DISTURBED SURFACES TO MATCH EXISTING.



SECTION A-A DETAIL

NO SCALE

SECTION A1-A1 DETAIL

NO SCALE

STANDBY GENERATOR
INSTALLATION AT COS
COB SCHOOL

Cos Cob School
300 E Putnam Avenue
Greenwich, CT 06807

SCALE:	AS NOTED	APPROVED BY:	RS	DRAWN BY:	LFG
DATE:	June 25, 2025	CHECKED BY:	EL		

PLUMBING DETAILS

BID NUMBER:	LFG JOB NUMBER:	DRAWING NUMBER:
2534-25	2025.LFG.003	P-002



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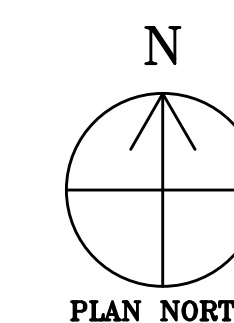
UF

1 PLUMBING FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"

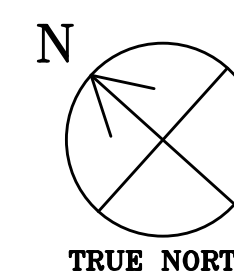


KEY NOTE:
CONTRACTOR SHALL ENGAGE MASON TO PATCH AND INFILL
EXISTING OPENING WITH LIKE MATERIALS CORE DRILL FOR
NEW PIPE PENETRATION SO THAT ROOF WATER WILL NOT
SPILL ONTO NEW GENERATOR

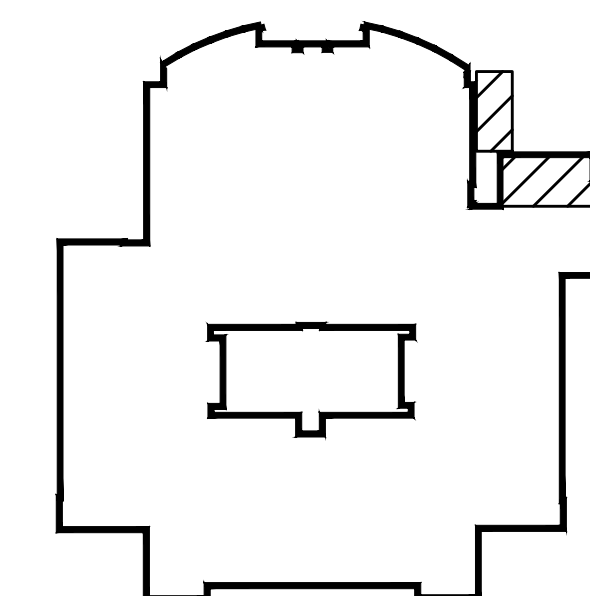
2 PLUMBING SECOND FLOOR ROOF PLAN
SCALE: 1/4" = 1'-0"



PLAN NORTH



TRUE NORTH



KEY PLAN
NO SCALE

[illegible]

STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: AS NOTED	APPROVED BY: RS	DRAWN BY: LFG
DATE: June 25, 2025		CHECKED BY: JL

PLUMBING
FIRST FLOOR AND SECOND
FLOOR ROOF PART PLANS

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: P-101
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ELECTRICAL LEGEND

	DUPLEX RECEPTACLE
	DUPLEX RECEPTACLE
	DOUBLE-DUPLEX RECEPTACLE
	DUPLEX GFCI RECEPTACLE
	DOUBLE-DUPLEX GFCI RECEPTACLE
	DEDICATED RECEPTACLE
	SPECIAL RECEPTACLE (NEMA CONFIG. NOTED)
	JUNCTION BOX
	JUNCTION BOX
	TELEPHONE RECEPTACLE
	DATA RECEPTACLE
	TEL/DATA RECEPTACLE
LP/XX →	HOMERUN
	LOCKABLE DISCONNECT SWITCH WITH RATINGS
	LOCKABLE FUSED DISCONNECT SWITCH WITH RATINGS
	MOTOR STARTER
	PANEL
	RECESSED PANEL
	LOAD CENTER
	RECESSED LOAD CENTER
	EXISTING PANEL
	EXISTING RECESSED PANEL
	SWITCH
	SWITCH, 3-WAY
	SWITCH, MOTOR RATED
	SWITCH, OCCUPANCY SENSOR
	SWITCH, VACANCY SENSOR
	SINGLE FACE EXIT SIGN, WITH DIRECTIONAL ARROWS
	DUAL FACE EXIT SIGN, WITH DIRECTIONAL ARROWS
	WALL MOUNTED EMERGENCY LIGHTING UNIT
	CEILING MOUNTED EMERGENCY LIGHTING UNIT
	CONDUIT UP
	CONDUIT DOWN

ABBREVIATIONS:

GRMC	RIGID METAL CONDUIT
GRGC	GALVANIZED RIGID STEEL CONDUIT (NEC RMC)
RGS	SEE GRC
IMC	INTERMEDIATE METAL CONDUIT (STEEL U.N.O.)
EMT	ELECTRICAL METAL TUBING (STEEL U.N.O.)
PVC	RIGID POLYVINYL CHLORIDE CONDUIT (SCHEDULE 40 U.N.O.)
FMC	FLEXIBLE METAL CONDUIT
LFMC	LIQUID TIGHT FLEXIBLE METAL CONDUIT
U.N.O.	UNLESS NOTED OTHERWISE
TYP.	TYPICAL
MIN.	MINIMUM
MAX.	MAXIMUM
gf	GROUND FAULT CIRCUIT INTERRUPTER TYPE
afci	ARC FAULT CIRCUIT INTERRUPTER TYPE
WP	WEATHER-PROOF WHILE IN USE TYPE
DN	CONDUIT UP
DN	CONDUIT DN
N/A	NOT APPLICABLE
N	NEUTRAL
C	CONDUIT
G	GROUND
GND	GROUND
CU	COPPER
AL	ALUMINUM
DS	DISCONNECT SWITCH
FDS	FUSED DISCONNECT SWITCH
MDS	MAIN DISCONNECT SWITCH
VFD	VARIABLE FREQUENCY DRIVE
MS	MOTOR STARTER
ATS	AUTOMATIC TRANSFER SWITCH
MTS	MANUAL TRANSFER SWITCH
EVSE	ELECTRIC VEHICLE SUPPLY EQUIPMENT
V	VOLTS
A	AMPS
AS	AMPS SWITCHED
AF	AMPS FUSED
AT	AMPS TRIP
HP	HORSE POWER
W	WATTS
VA	VOLT-AMPS
kW	KILOWATTS
Ø	PHASE
PH	PHASE
LF	LINEAR FEET
ARCH.	ARCHITECT
GC	GENERAL CONTRACTOR
EC	ELECTRICAL CONTRACTOR
MC	MECHANICAL CONTRACTOR
PC	PLUMBING CONTRACTOR
COORD.	COORDINATE
I _{sc}	PROSPECTIVE SHORT CIRCUIT CURRENT
SCCR	SHORT CIRCUIT CURRENT RATING
IR	INTERRUPT RATING
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
Vd	VOLTAGE DROP
Vd%	VOLTAGE DROP PERCENTAGE (OF SYSTEM L-L VOLTAGE)
MCA	MINIMUM CIRCUIT AMPACITY
FLA	FULL LOAD AMPERES
RLA	RATED LOAD AMPERES
LRA	LOCKED ROTOR AMPERES
MOCF	MAXIMUM OVER CURRENT PROTECTION
RFS	RECOMMENDED FUSE SIZE
(N)	NEW
(E)	EXISTING TO REMAIN
(RL)	RELOCATED EXISTING
(ER)	EXISTING DEVICE RELOCATED
(R)	REMOVE EXISTING

GENERAL NOTES:

1. WRITTEN (BOOK) SPECIFICATIONS ARE PART OF THIS CONTRACT.
2. ALL WORK SHOWN IS NEW UNLESS INDICATED AS EXISTING.

CODE NOTES:

CONTRACTOR SHALL PERFORM ALL WORK IN STRICT COMPLIANCE TO ALL APPLICABLE
CODES AS ADOPTED BY THE AUTHORITY HAVING JURISDICTION, INCLUDING BUT NOT LIMITED
TO:

2022 CONNECTICUT STATE BUILDING CODE
2021 INTERNATIONAL BUILDING CODE
2021 INTERNATIONAL EXISTING BUILDING CODE
2021 INTERNATIONAL PLUMBING CODE
2021 INTERNATIONAL MECHANICAL CODE
2021 INTERNATIONAL RESIDENTIAL CODE
2021 INTERNATIONAL ENERGY CONSERVATION CODE
2020 NATIONAL ELECTRICAL CODE - NFPA 70 (NEC)
2017 ICC A117.1 ACCESSIBLE AND USABLE BUILDINGS & FACILITIES
2022 CONNECTICUT STATE FIRE PREVENTION CODES
2021 FIRE CODE - NFPA 1
2022 CONNECTICUT STATE FIRE SAFETY CODE
2021 INTERNATIONAL FIRE CODE
2021 LIFE SAFETY CODE - NFPA 101

ALL CODES REFERENCED APPLY WITH THE ADDITIONS, AMENDMENTS, AND DELETIONS MADE BY THE STATE OF CONNECTICUT.

REQUIRED IDENTIFICATION:

1. ALL ELECTRICAL EQUIPMENT SHALL BE MARKED WITH THEIR TAG,
2. ALL PANELS SHALL BE MARKED WITH THEIR TAG, VOLTAGE, PHASE, BUS RATING, MAIN RATING, AND WHERE THEY ARE FED FROM (PHYSICAL LOCATION, PANEL TAG AND CIRCUIT NUMBER IF APPLICABLE).
3. ALL DISCONNECTS SHALL BE MARKED WITH THE EQUIPMENT THAT THEY SERVE.
4. ALL SERVICE EQUIPMENT SHALL BE MARKED WITH THE AVAILABLE FAULT CURRENT.
5. EACH UTILITY METER AND SERVICE DISCONNECT SHALL BE MARKED WITH THE AREA IT SERVES.
6. RECEPTACLES AND EQUIPMENT DISCONNECTS SHALL BE MARKED WITH A SELF-ADHESIVE TYPED LABEL INDICATING THE PANEL AND CIRCUIT THEY ARE FED FROM. FOR INTERIOR AREAS THE LABEL SHALL BE ON THE FACE OF THE COVER PLATE OR DISCONNECT. FOR EXTERIOR RECEPTACLES THE LABEL SHALL BE INSIDE THE WEATHER PROOF ENCLOSURE AND FOR EXTERIOR DISCONNECTS ON THE EXTERIOR & INTERIOR OF THE DISCONNECT DOOR.
7. RECEPTACLE LABELS BACKGROUND SHALL MATCH THE COVER PLATE COVER OR BE CLEAR. LETTERING SHALL BE A CONTRASTING COLOR FROM BACKGROUND.
8. CONTRACTOR SHALL REMOVE ANY EXISTING LABELS THAT ARE NO LONGER ACCURATE DUE TO THIS PROJECT.
9. CONTRACTOR SHALL PROVIDE NEW ACCURATE IDENTIFICATION LABELS FOR EXISTING EQUIPMENT ALTERED OR RECIRCUITED BY THIS PROJECT.
10. PROVIDE SECONDARY POWER SOURCE WARNING LABEL ON BUILDING'S MAIN SERVICE DISCONNECT PER NEC 702.7(A). INDICATE THE TYPE AND LOCATION OF STANDBY POWER SOURCE ON THE LABEL.

CONNECTIONS TO VIBRATING EQUIPMENT:

ALL CONNECTIONS TO VIBRATING EQUIPMENT SHALL BE MADE WITH FLEXIBLE CONDUIT, FMC IF INTERIOR AND LFMC IF EXTERIOR.

TAMPER RESISTANT RECEPTACLES:

ALL 15A AND 20A , 125- AND 250-VOLT NON-LOCKING TYPE RECEPTACLES SHALL BE LISTED TAMPER RESISTANT RECEPTACLES PER NEC 406.12(4).

GENERATOR LOAD STAGING:

- STAGE 1 SHALL START IMMEDIATELY UPON GENERATOR START AND POWER TRANSFER.
- STAGE 2 SHALL STARTING SHALL BE DELAYED 5 MINUTES FROM GENERATOR START AND POWER TRANSFER. THIS DELAY SHALL BE IMPLEMENTED IN THE BMS BY THE DISTRICT BMS VENDOR.
- STAGE 3 ARE INTERMITTENT LOADS.

STAGE 1 LOADS:

FIRE ALARM
AOR SYSTEM
SECURITY SYSTEM
BMS SYSTEM
EMERGENCY LIGHTING INVERTERS
ELEVATOR ACCESSORY POWER
REFRIGERATORS
FREEZERS
IT UPS
UNIT HEATERS
LIGHTING
ALL OTHER LOADS CONNECTED TO PANEL SB-PP

STAGE 2 LOADS:

BOILERS
BOILER PUMPS
HOT WATER PUMPS

STAGE 3 LOADS:

ELEVATOR
STAGE ADA LIFT

PROVIDE CONTROL WIRING FROM ATS-SB TO BOILER ROOM BMS PANEL FOR DETECTION OF POWER TRANSFER TO GENERATOR.

CONSTRUCTION PHASING PLAN:

CONTRACTOR SHALL KEEP EXISTING PANEL NE, MANUAL TRANSFER SWITCH, FEEDER, AND GENERATOR CONNECTION POINT INSTALLED UNTIL NEW GENERATOR AND ASSOCIATED SYSTEMS ARE INSTALLED AND FUNCTIONAL.

RECIRCUITING OF EXISTING LOADS ON TO GENERATOR PANEL:

1. WHERE PRACTICAL THE CONTRACTOR SHALL REUSE THE EXISTING CIRCUIT CONDUCTORS. PROVIDE LABELED SPLICE BOX, LISTED SPLICE CONNECTORS, AND CONDUCTOR AND CONDUIT TO EXTEND TO DESIGNATED PANEL AND CIRCUIT.
2. WHERE REUSE OF EXISTING CONDUCTORS IS NOT PRACTICAL THE CONTRACTOR SHALL PROVIDE NEW CONDUCTORS AND CONDUIT.

REQUIRED ELECTRICAL STUDIES:

1. REFER TO WRITTEN (BOOK) SPECIFICATIONS.
2. ELECTRICAL CONTRACTOR SHALL PERFORM SHORT CIRCUIT, SELECTIVE COORDINATION, AND ARC-FLASH STUDIES FOR ALL EQUIPMENT AS DESCRIBED IN SECTION 260573 POWER SYSTEM STUDIES.
3. STUDIES SHALL BE BASED ON THE ACTUAL ELECTRICAL EQUIPMENT TO BE INSTALLED.
4. ELECTRICAL CONTRACTOR SHALL PERFORM ALL REQUIRED FIELD SURVEY, EQUIPMENT DATA GATHERING, AND UTILITY COORDINATION FOR STUDIES.
5. APPLY ALL ARC-FAULT LABELS TO THE APPROPRIATE EQUIPMENT.
6. SET ALL ADJUSTABLE CIRCUIT BREAKERS SETTING TO THE SETTINGS STATED IN THE SELECTIVE COORDINATION STUDY.
7. ELECTRICAL EQUIPMENT IS NOT RELEASED FOR PRODUCTION UNTIL STUDIES ARE REVIEWED AND APPROVED BY THE ENGINEER.

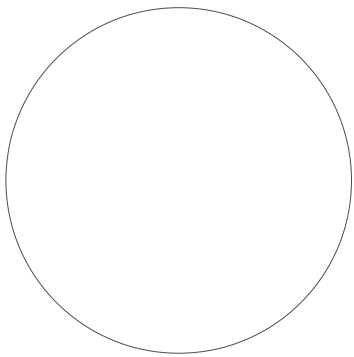


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LFG

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	06-25-2025	ISSUED FOR BID
	06-08-2023	ISSUED FOR PROGRESS
REV	DATE	DESCRIPTION



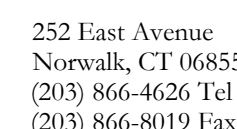
STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: N.T.S.	APPROVED BY: RS	DRAWN BY: LC
DATE: June 25, 2025		CHECKED BY: EL

ELECTRICAL LEGEND, NOTES, & ABBREVIATIONS

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: E-001
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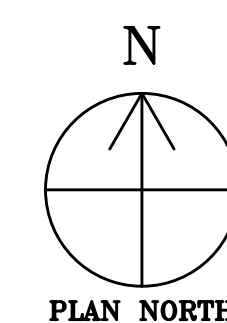


LANDMARK
FACILITIES
GROUP, INC.

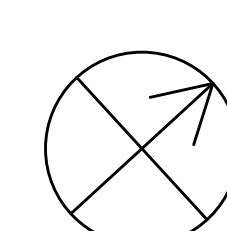
A RECIRCUIT ELEVATOR CIRCUIT TO PANEL SB-PP. EXISTING CIRCUIT FROM MAIN SWITCHBOARD MSB.1.

B RECIRCUIT (E) ELEVATOR ACCESSORY CIRCUITS:
1. ELEVATOR LIGHTING
2. ELEVATOR RECALL
3. ELEVATOR PIT RECEPTACLE
4. ELEVATOR PIT LIGHTING
5. ELEVATOR SHUNT TRIP
THE EXISTING CIRCUITS ARE FROM PANEL LP/B

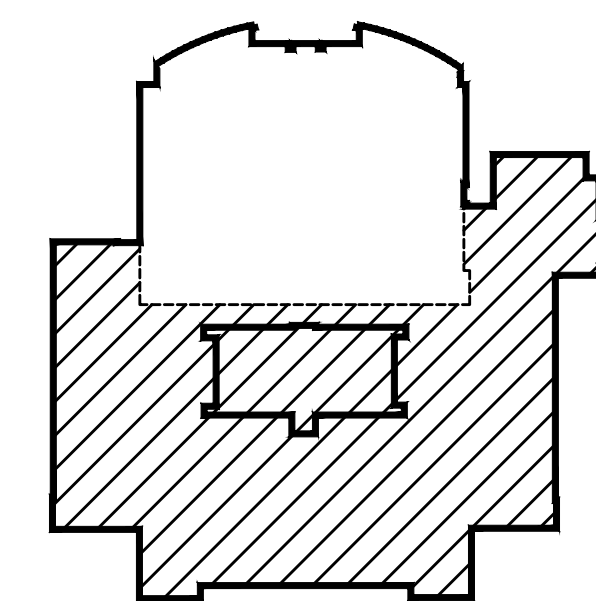
C RECIRCUIT AOR SYSTEM PANEL CIRCUIT TO PANEL SB-PP. EXISTING CIRCUIT FROM PANEL NE.



PLAN NORTH



TRUE NORTH



KEY PLAN
NO SCALE

1 FIRST FLOOR PLAN-SOUTH
SCALE: 3/32" = 1'-0"

[illegible]

STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: AS NOTED	APPROVED BY: RS	DRAWN BY: LC
DATE: June 25, 2025		CHECKED BY: EL

FIRST FLOOR ELECTRICAL
POWER PLAN-SOUTH

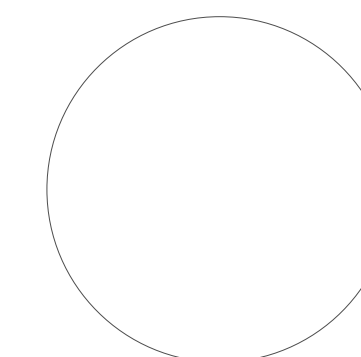
BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: E-100
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A	RECIRCUIT STORAGE UNIT HEATER CIRCUIT TO PANEL <u>SB-PP</u> . EXISTING CIRCUIT FROM PANEL <u>DP/4</u> .
B	RECIRCUIT REFRIGERATOR OR FREEZER CIRCUIT TO PANEL <u>SB-PP</u> . EXISTING CIRCUIT FROM PANEL <u>KP/1</u> .
C	RECIRCUIT STAGE ADA LIFT CIRCUIT TO PANEL <u>SB-PP</u> . EXISTING CIRCUIT FROM PANEL <u>LP/C</u> .
D	RECIRCUIT FA SYSTEM PANELS CIRCUIT TO PANEL <u>SB-PP</u> . EXISTING CIRCUIT FROM PANEL <u>NE</u> .
E	RECIRCUIT EMERGENCY LIGHTING INVERTER CIRCUIT TO PANEL <u>SB-PP</u> . EXISTING CIRCUIT FROM PANEL <u>NE</u> .



	06-25-2025	ISSUED FOR BID
	06-16-2025	ISSUED FOR PROGRESS
REV	DATE	DESCRIPTION



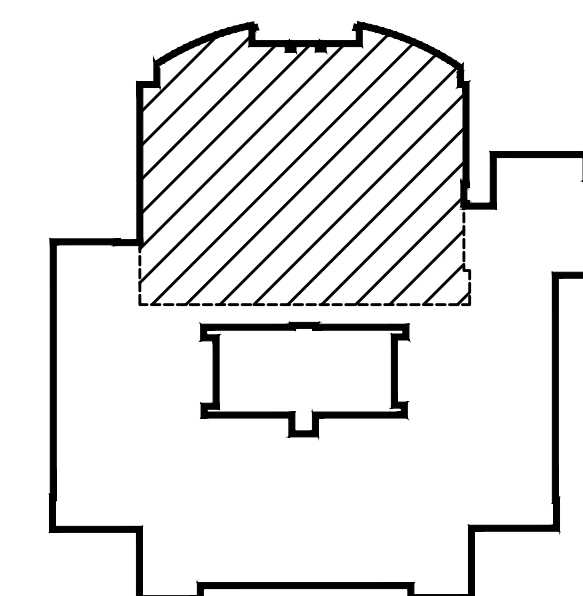
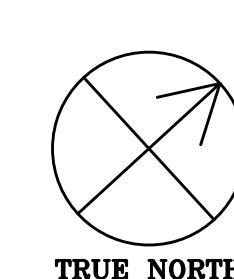
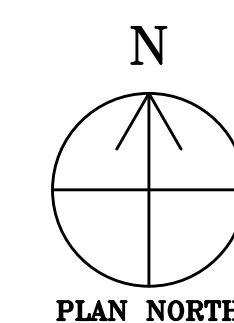
STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: AS NOTED	APPROVED BY: RS	DRAWN BY: LC
DATE: June 25, 2025		CHECKED BY: EL

FIRST FLOOR ELECTRICAL
POWER PLAN-NORTH

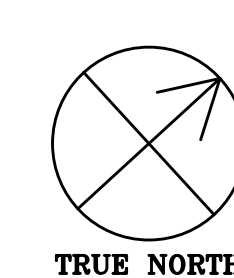
BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: E-101
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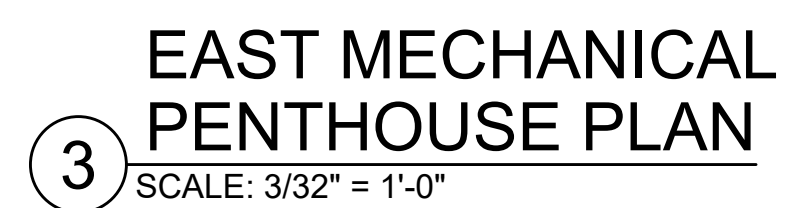
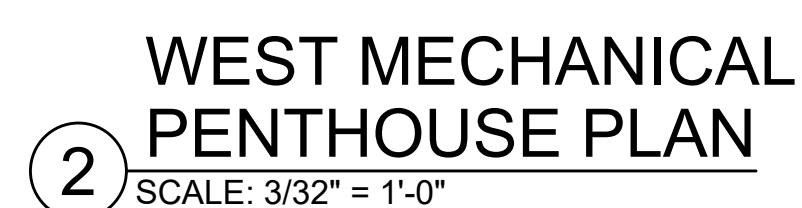


KEY PLAN
NO SCALE



- | | | |
|-------------------------------|---|---------------------------------|
| BID NUMBER:
2534-25 | LFG JOB NUMBER:
2025.LFG.0023 | DRAWING NUMBER:
E-102 |
|-------------------------------|---|---------------------------------|





TRUE NORTH



STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

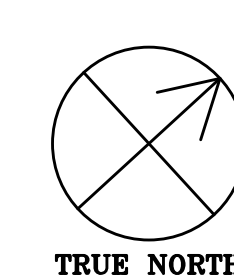
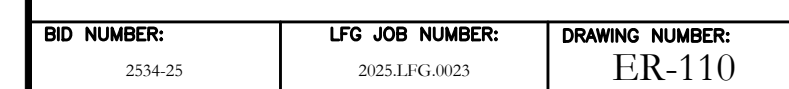
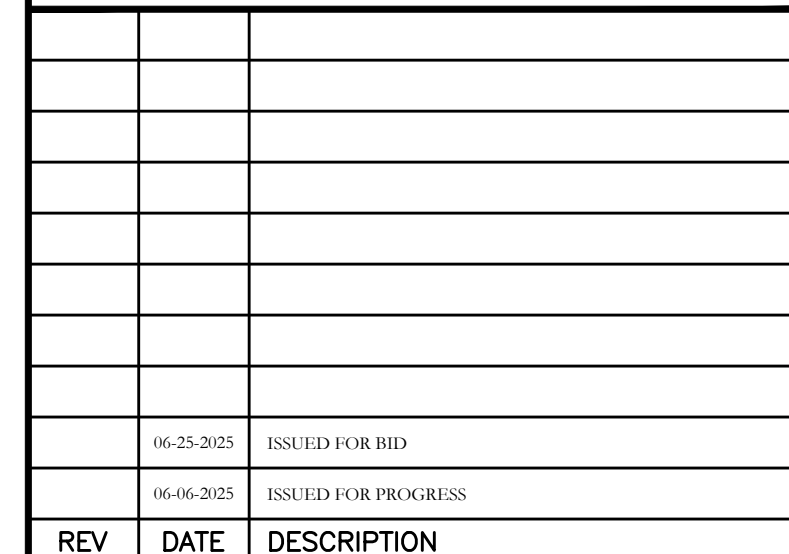
Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

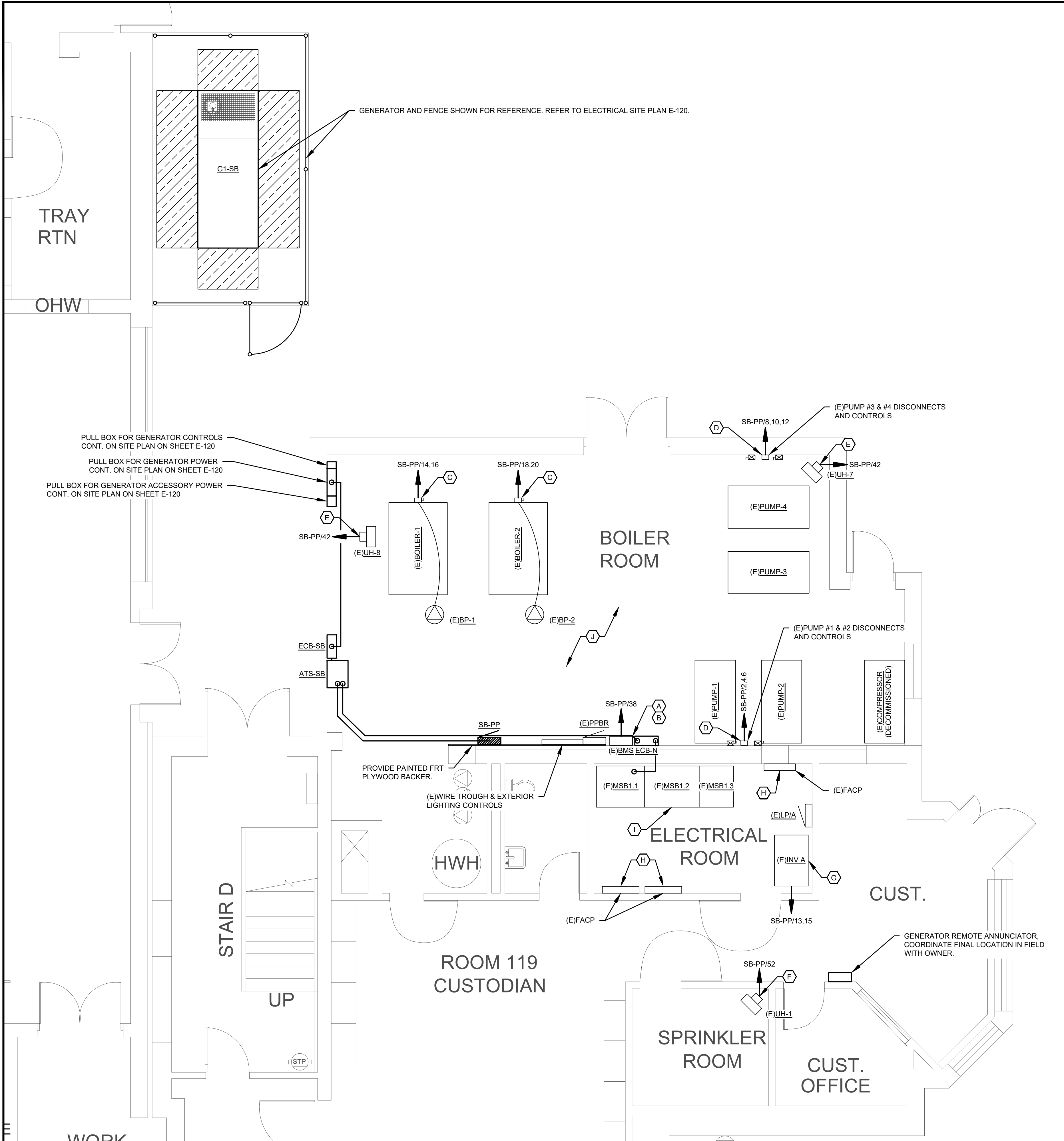
THIRD FLOOR AND MECHANICAL PENTHOUSES ELECTRICAL POWER PLANS

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: E-103
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REFER TO PHASING PLAN ON SHEET E-001.





KEYNOTES:

- (A) CONTRACTOR SHALL SUB-CONTRACT DISTRICT BMS VENDOR TO PROVIDE BMS PANEL WITH NEW UNINTERRUPTIBLE POWER SUPPLY AND TO PERFORM ALL BMS BASED LOAD STAGING.
- (B) RECIRCUIT BMS PANEL TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL PPBR.
- (C) RECIRCUIT BOILER AND BOILER PUMP CIRCUIT TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL NE.
- (D) RECIRCUIT HOT WATER PUMPS CIRCUIT TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL NE.
- (E) RECIRCUIT BOILER ROOM UNIT HEATER TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL PPBR.
- (F) RECIRCUIT SPRINKLER ROOM UNIT HEATER TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL LP/A.
- (G) RECIRCUIT EMERGENCY LIGHTING INVERTER CIRCUIT TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL NE.
- (H) RECIRCUIT FIRE ALARM SYSTEM PANELS CIRCUIT TO PANEL SB-PP, EXISTING CIRCUIT FROM PANEL NE.
- (I) PROVIDE SECONDARY POWER SOURCE WARNING LABEL ON SERVICE DISCONNECT.
- (J) RECIRCUIT ALL BOILER ROOM LIGHTING TO PANEL SB-PP.

REV	DATE	DESCRIPTION
	06-25-2025	ISSUED FOR BID
	06-06-2025	ISSUED FOR PROGRESS

STANDBY GENERATOR
INSTALLATION AT COS
COB SCHOOL

Cos Cob School
300 E Putnam Avenue
Greenwich, CT 06807

SCALE: AS NOTED	APPROVED BY: RS	DRAWN BY: L.C.
DATE: June 25, 2025	CHECKED BY: EL	

ENLARGED FIRST FLOOR
ELECTRICAL POWER PLAN

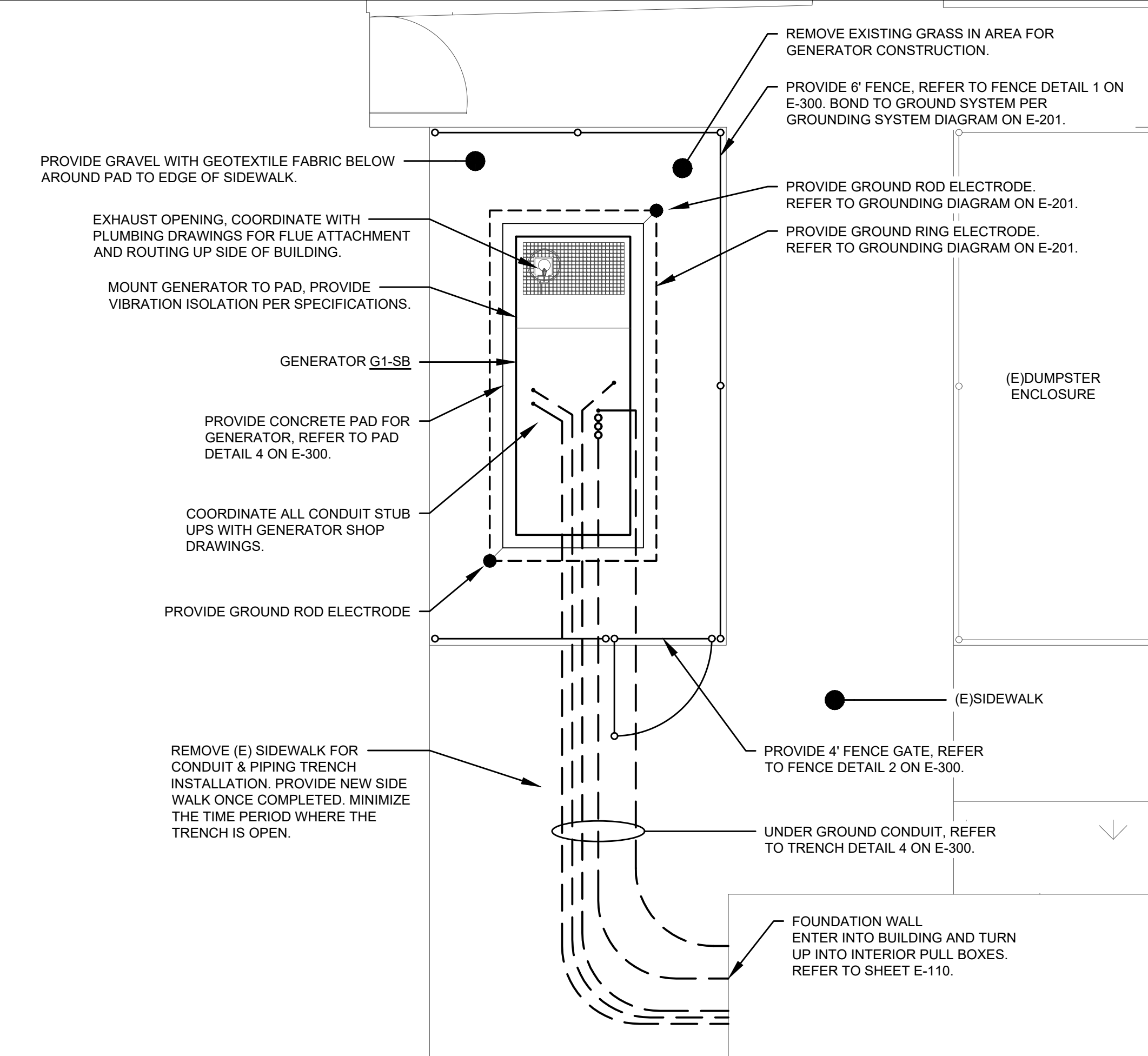
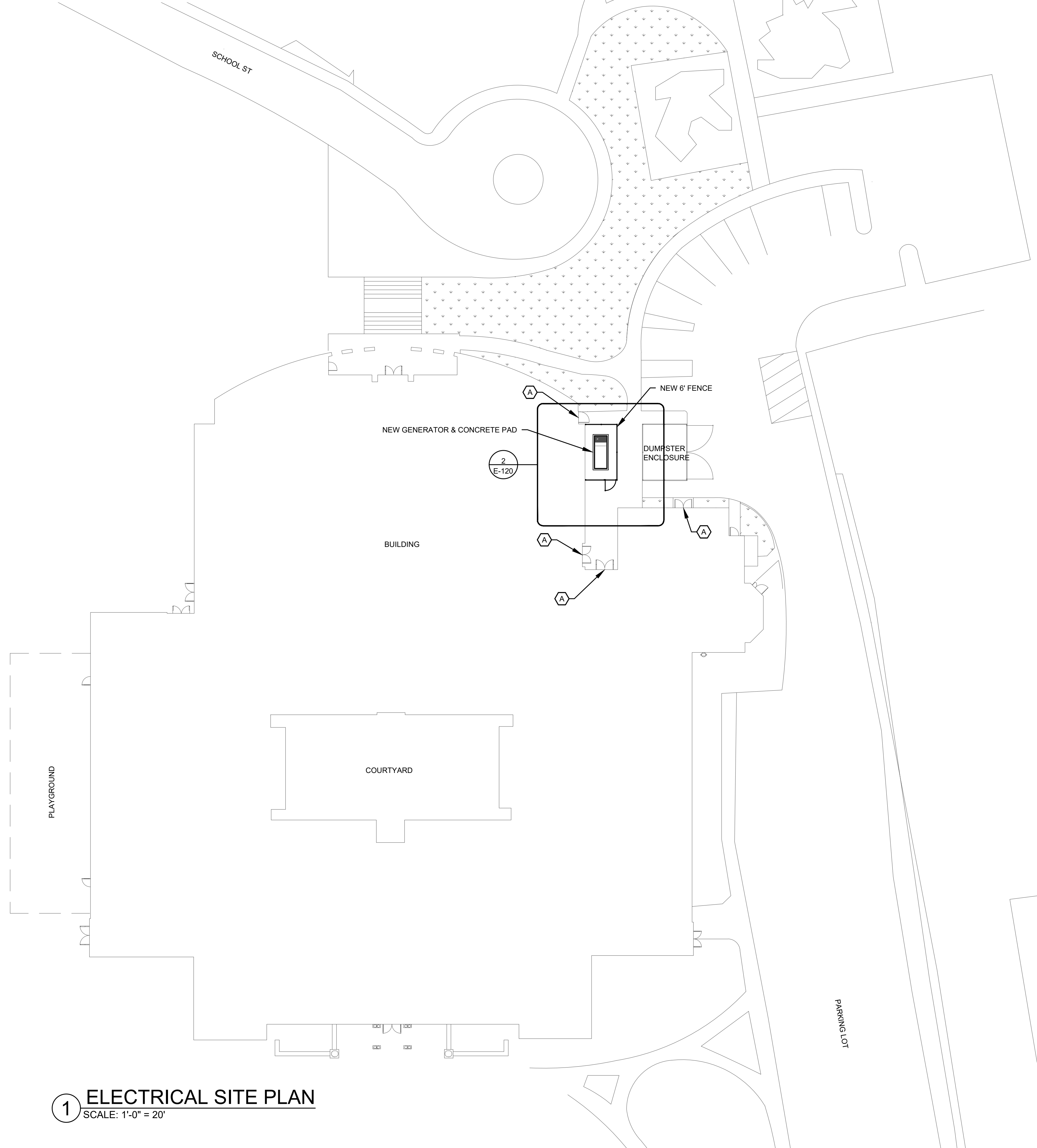
BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.003	DRAWING NUMBER: E-110
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NOTES:

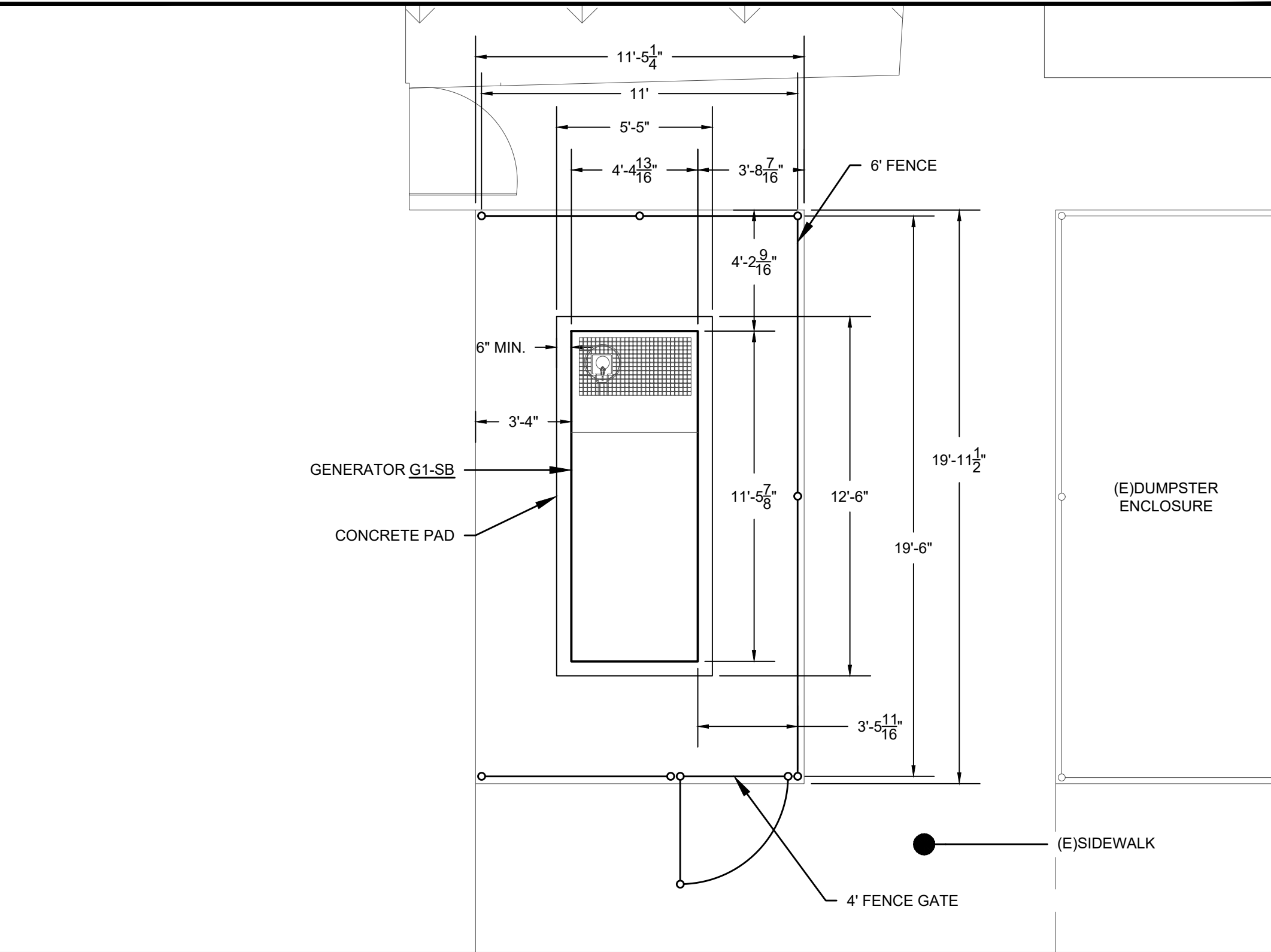
1. PROVIDE CONSTRUCTION FENCING AROUND PROJECT AREA. COORDINATE WITH OWNER IN FIELD. PROTECT AND MAINTAIN BUILDING EGRESS, UNLESS A BUILDING EXIT CLOSURE IS APPROVED IN WRITING BY OWNER AND AHJ.

KEYNOTES:

- (A) CLOSE BUILDING EXITS WHILE EXIT ACCESS IS BLOCKED, RESTRICTED OR UNSAFE. SCHEDULE CLOSURE WITH OWNER. DO NOT PROCEED WITHOUT WRITTEN APPROVAL. COORDINATE WITH AHJ (BUILDING INSPECTOR AND FIRE MARSHAL) FOR PROPER CLOSURE PROCEDURE. PROVIDE TEMPORARY SIGNAGE AND BARRIERS.



2 ENLARGED ELECTRICAL SITE PLAN
SCALE: 1/4" = 1'-0"



3 ENLARGED ELECTRICAL SITE PLAN-DIMENSIONED
SCALE: 1/4" = 1'-0"

LANDMARK FACILITIES GROUP, INC.

252 East Avenue
Norwalk, CT 06855
(203) 866-4626 Tel
(203) 866-8019 Fax

REV	DATE	DESCRIPTION
06-25-2025		ISSUED FOR BID
06-06-2025		ISSUED FOR PROGRESS

STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Avenue
Greenwich, CT 06807

SCALE: AS NOTED
DATE: June 25, 2025

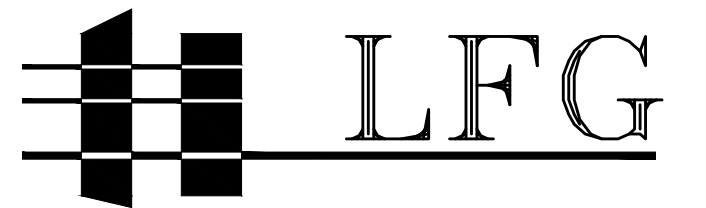
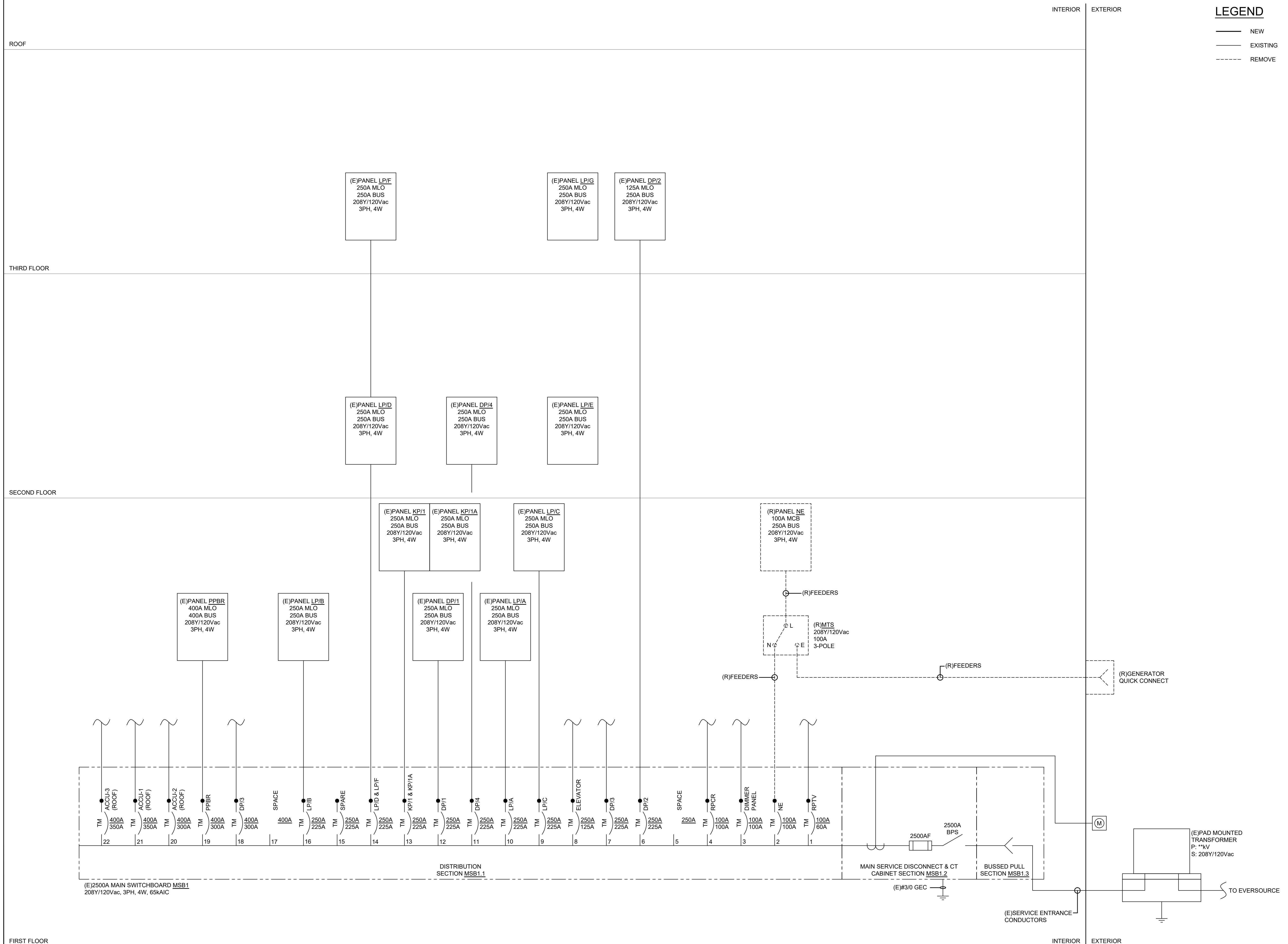
APPROVED BY: RS
CHECKED BY: EL

DRAWN BY: L.C.
ELECTRICAL SITE PLAN

BID NUMBER: 2534-25
LFG JOB NUMBER: 2025.LFG.003
DRAWING NUMBER: E-120

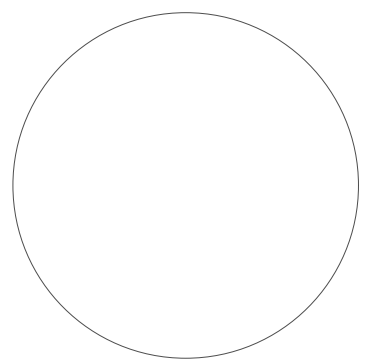
One Line Diagram

NOTE: REFER TO LEGEND OF FEEDERS SIZES ON SHEET E-300. ALL CIRCUIT BREAKERS ARE 3 POLE U.N.O..



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LANDMARK
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GROUP, INC.

[illegible]

STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

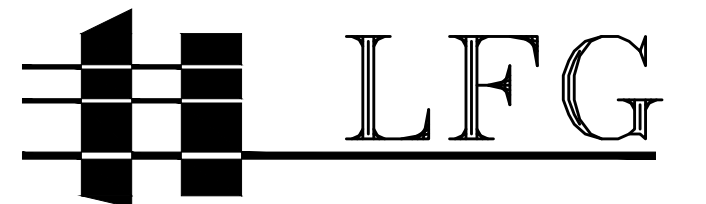
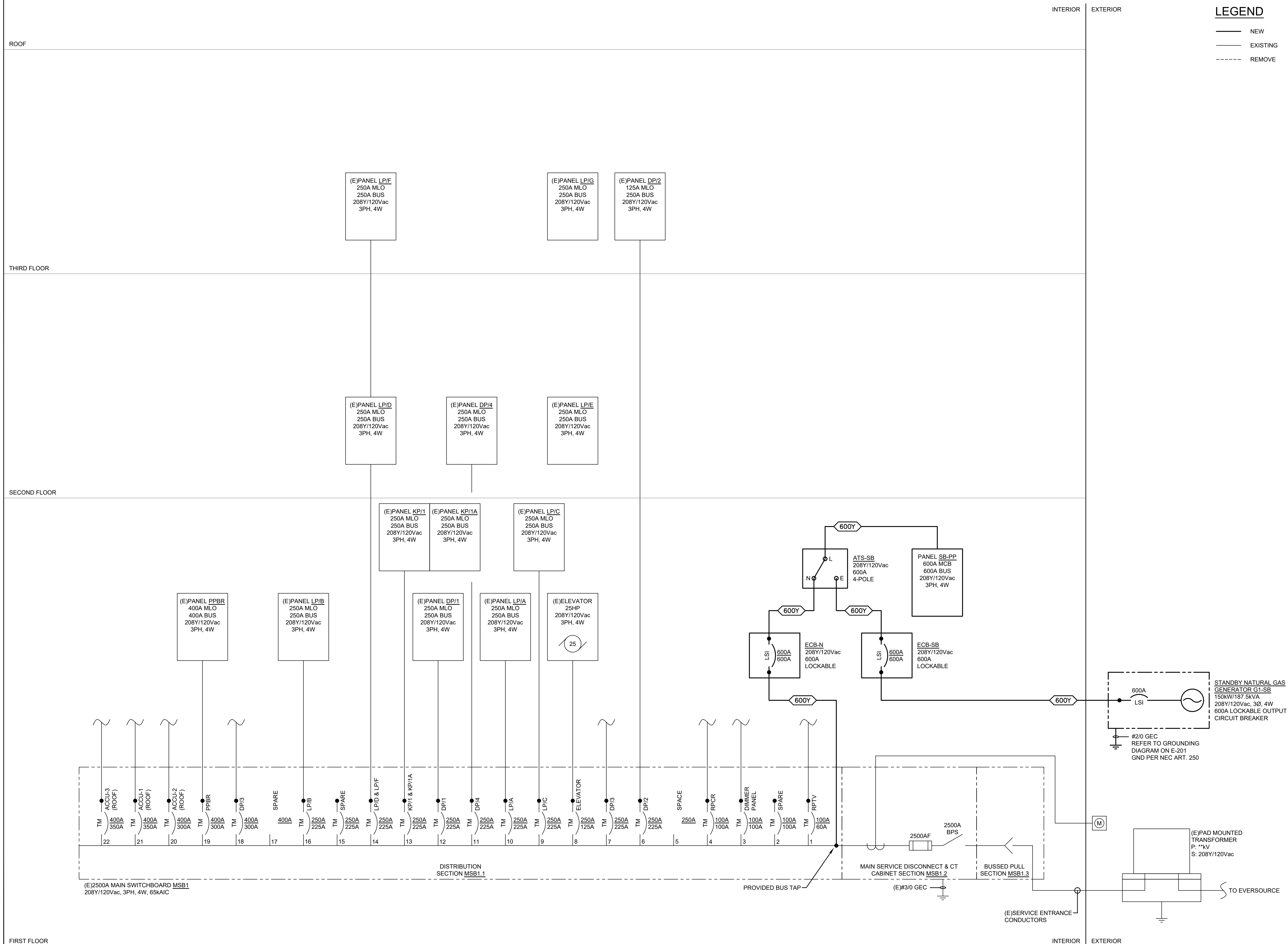
SCALE: N.T.S.	APPROVED BY: RS	DRAWN BY: LC
DATE: June 25, 2025		CHECKED BY: EL

REMOVALS ONE LINE DIAGRAM

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: ER-200
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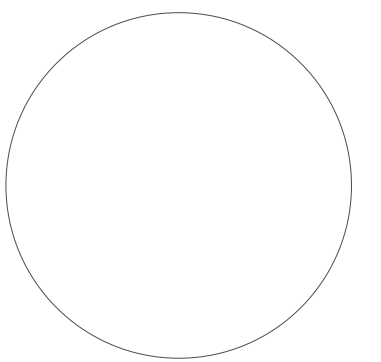
One Line Diagram

NOTE: REFER TO LEGEND OF FEEDERS SIZES ON SHEET E-300. ALL CIRCUIT BREAKERS ARE 3 POLE U.N.O..



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STANDBY GENERATOR INSTALLATION AT COS COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

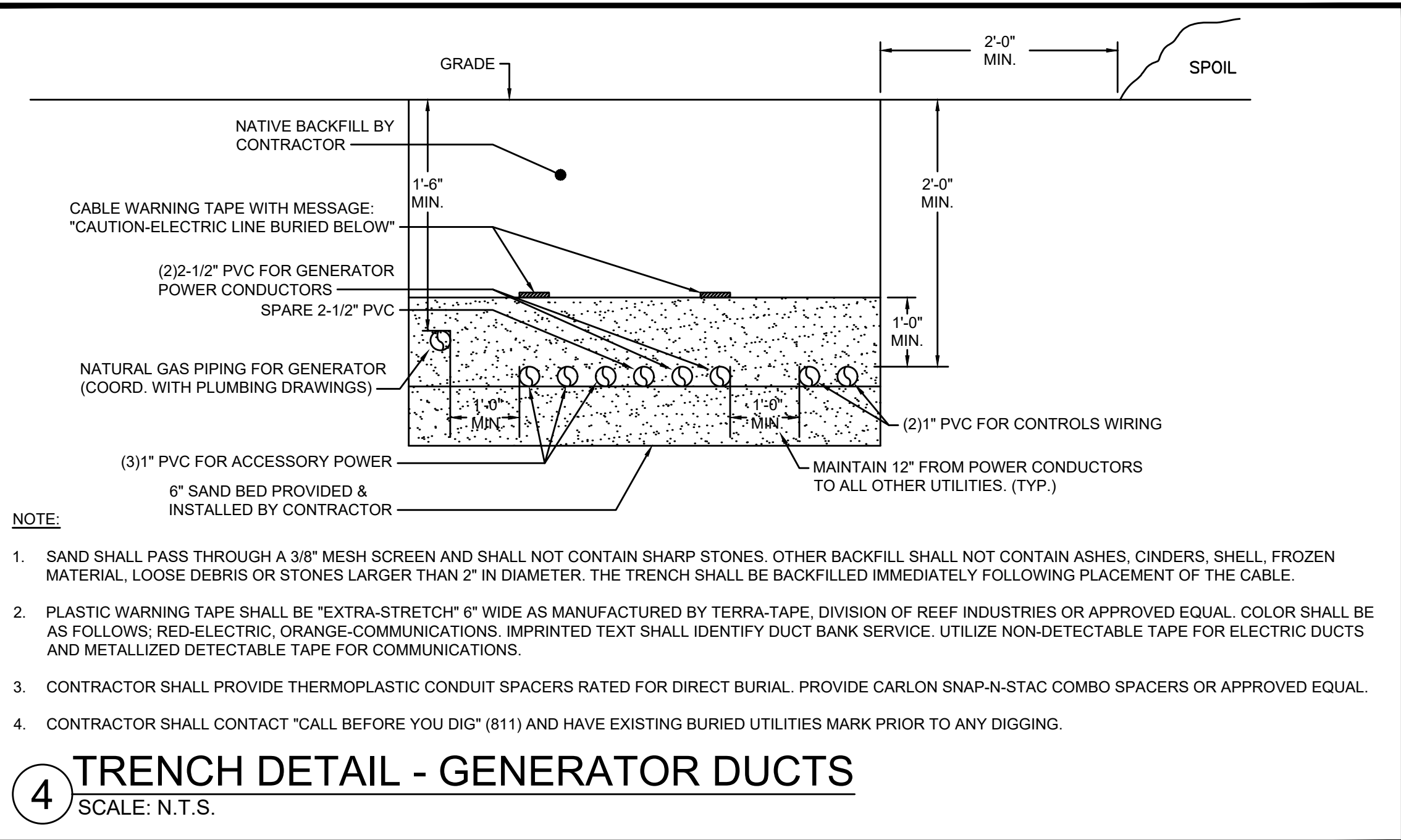
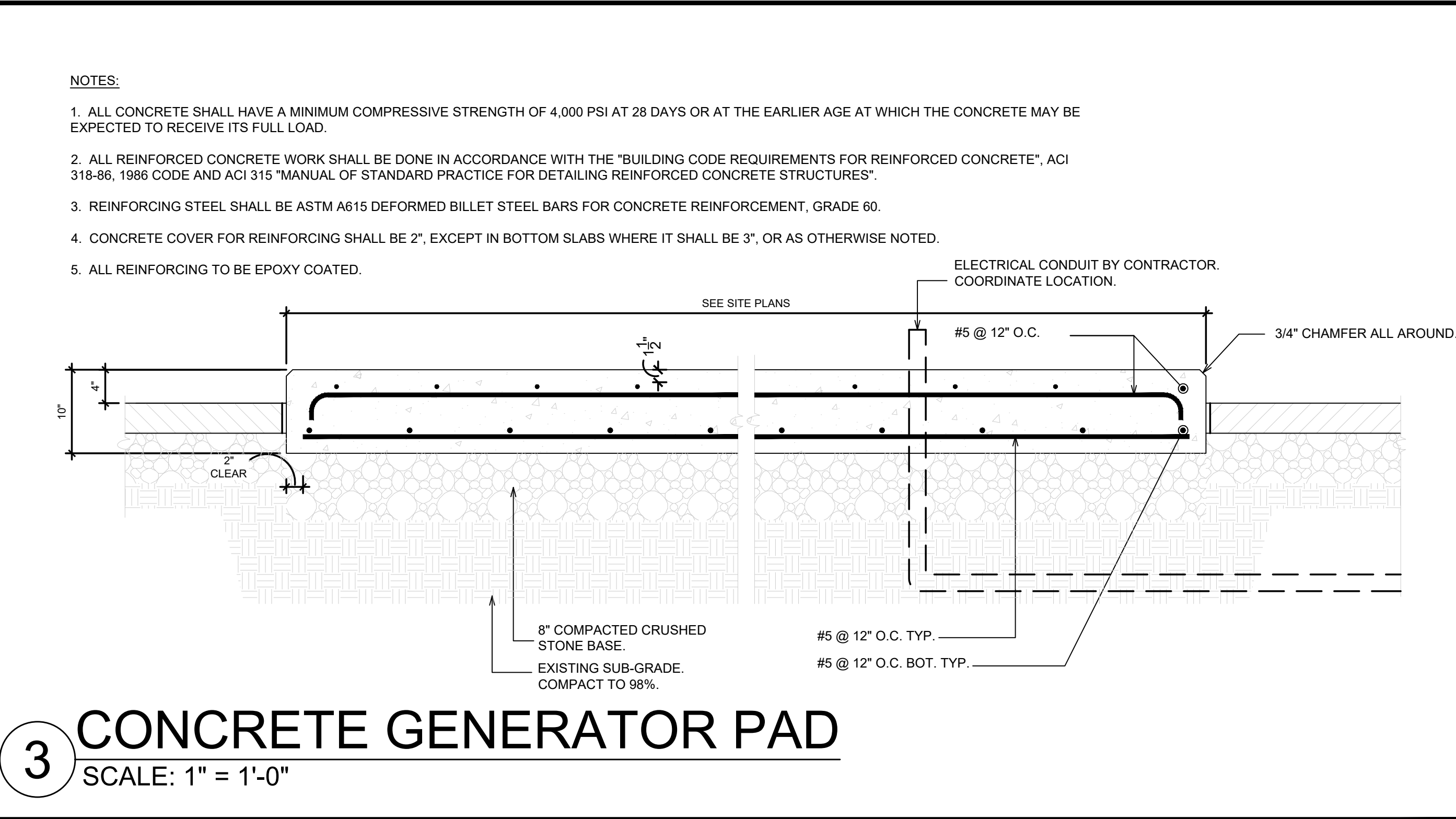
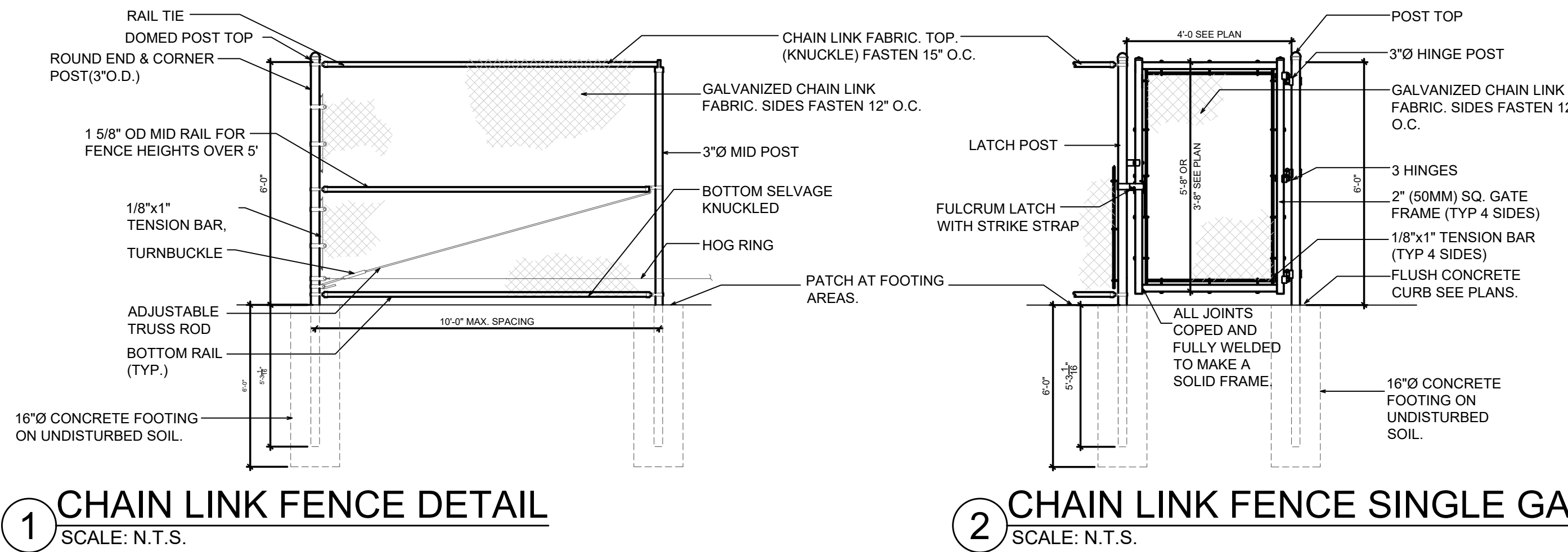
SCALE: N.T.S.	APPROVED BY: RS	DRAWN BY: LC
DATE: June 25, 2025		CHECKED BY: EL

ONE LINE DIAGRAM

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: E-200
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- | | | | |
|--|--|----------------------------------|--|
| <h1 style="text-align: center;">Cos Cob School</h1> <h2 style="text-align: center;">300 E Putnam Avenue
Greenwich, CT 06807</h2> | | | |
| SCALE: N.T.S. | | APPROVED BY: | |
| DATE: June 25, 2025 | | RS | |
| | | DRAWN BY: LC | |
| | | CHECKED BY: EL | |
| <h1>ELECTRICAL GROUNDING
DIAGRAM</h1> | | | |
| BID NUMBER:
2534-25 | | LFG JOB NUMBER:
2025-LFG-0023 | |
| | | DRAWING NUMBER:
E-201 | |



LEGEND OF FEEDER SIZES			
75°C COPPER CONDUCTORS			
NOMINAL AMPERE RATING	FEEDER TAG & MODIFICATIONS	CONDUCTORS	MINIMUM RACEWAY SIZE
15	15*	- 3-#12 AWG; 1-#12 AWG GND	1/2"
		Y 3-#12 AWG; 1-#12 AWG N; 1-#12 AWG GND	
		K CHANGE NEUTRAL TO 2-#12 AWG	1/2"
		G ADD 1-#12 AWG IG	
20	20*	- 3-#12 AWG; 1-#12 AWG GND	1/2"
		Y 3-#12 AWG; 1-#6=12 AWG N; 1-#12 AWG GND	
		K CHANGE NEUTRAL TO 2-#12 AWG	1/2"
		G ADD 1-#12 AWG IG	
25	25*	- 3-#10 AWG; 1-#10 AWG GND	1/2"
		Y 3-#10 AWG; 1-#10 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#10 AWG	3/4"
		G ADD 1-#10 AWG IG	
30	30*	- 3-#10 AWG; 1-#10 AWG GND	1/2"
		Y 3-#10 AWG; 1-#10 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#10 AWG	3/4"
		G ADD 1-#10 AWG IG	
35	35*	- 3-#8 AWG; 1-#10 AWG GND	3/4"
		Y 3-#8 AWG; 1-#8 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#8 AWG	1"
		G ADD 1-#10 AWG IG	
40	40*	- 3-#8 AWG; 1-#10 AWG GND	3/4"
		Y 3-#8 AWG; 1-#8 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#8 AWG	1"
		G ADD 1-#10 AWG IG	
45	45*	- 3-#6 AWG; 1-#10 AWG GND	1"
		Y 3-#6 AWG; 1-#6 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#6 AWG	1"
		G ADD 1-#10 AWG IG	
50	50*	- 3-#6 AWG; 1-#10 AWG GND	1"
		Y 3-#6 AWG; 1-#6 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#6 AWG	1"
		G ADD 1-#10 AWG IG	
60	60*	- 3-#6 AWG; 1-#10 AWG GND	1"
		Y 3-#6 AWG; 1-#6 AWG N; 1-#10 AWG GND	
		K CHANGE NEUTRAL TO 2-#6 AWG	1"
		G ADD 1-#10 AWG IG	
70	70*	- 3-#4 AWG; 1-#8 AWG GND	1-1/4"
		Y 3-#4 AWG; 1-#4 AWG N; 1-#8 AWG GND	
		K CHANGE NEUTRAL TO 2-#4 AWG	1-1/4"
		G ADD 1-#8 AWG IG	
100	100*	- 3-#3 AWG; 1-#8 AWG GND	1-1/4"
		Y 3-#3 AWG; 1-#3 AWG N; 1-#8 AWG GND	
		K CHANGE NEUTRAL TO 2-#3 AWG	1-1/4"
		G ADD 1-#8 AWG IG	
125	125*	- 3-#1 AWG; 1-#6 AWG GND	1-1/2"
		Y 3-#1 AWG; 1-#1 AWG N; 1-#6 AWG GND	
		K CHANGE NEUTRAL TO 2-#1 AWG	2"
		G ADD 1-#6 AWG IG	
150	150*	- 3-#1/0 AWG; 1-#6 AWG GND	1-1/2"
		Y 3-#1/0 AWG; 1-#1/0 AWG N; 1-#6 AWG GND	
		K CHANGE NEUTRAL TO 2-#1/0 AWG	2"
		G ADD 1-#6 AWG IG	
175	175*	- 3-#2/0 AWG; 1-#6 AWG GND	2"
		Y 3-#2/0 AWG; 1-#2/0 AWG N; 1-#6 AWG GND	
		K CHANGE NEUTRAL TO 2-#2/0 AWG	2"
		G ADD 1-#6 AWG IG	
200	200*	- 3-#3/0 AWG; 1-#6 AWG GND	2"
		Y 3-#3/0 AWG; 1-#3/0 AWG N; 1-#6 AWG GND	
		K CHANGE NEUTRAL TO 2-#3/0 AWG	2-1/2"
		G ADD 1-#6 AWG IG	
225	225*	- 3-#4/0 AWG; 1-#4 AWG GND	2"
		Y 3-#4/0 AWG; 1-#4/0 AWG N; 1-#4 AWG GND	
		K CHANGE NEUTRAL TO 2-#4/0 AWG	2-1/2"
		G ADD 1-#4 AWG IG	
250	250*	- 3-250MCM; 1-#4 AWG GND	2-1/2"
		Y 3-250MCM; 1-250MCM N; 1-#4 AWG GND	
		K CHANGE NEUTRAL TO 2-250MCM	2-1/2"
		G ADD 1-#4 AWG IG	
300	300*	- 3-350MCM; 1-#4 AWG GND	2-1/2"
		Y 3-350MCM; 1-350MCM N; 1-#4 AWG GND	
		K CHANGE NEUTRAL TO 2-350MCM	3"
		G ADD 1-#4 AWG IG	
350	350*	- 3-500MCM; 1-#3 AWG GND	3"
		Y 3-500MCM; 1-500MCM N; 1-#3 AWG GND	
		K CHANGE NEUTRAL TO 2-500MCM	3-1/2"
		G ADD 1-#3 AWG IG	
400	400*	- 3-500MCM; 1-#3 AWG GND	3"
		Y 3-500MCM; 1-500MCM N; 1-#3 AWG GND	
		K CHANGE NEUTRAL TO 2-500MCM	3-1/2"
		G ADD 1-#3 AWG IG	
450	450*	- (2 SETS OF) 3-#4/0 AWG; 1-#2 AWG GND	(2) 2"
		Y (2 SETS OF) 3-#4/0 AWG; 1-#4/0 AWG N; 1-#2 AWG GND	
500	500*	- (2 SETS OF) 3-250MCM; 1-#2 AWG GND	(2) 2-1/2"
		Y (2 SETS OF) 3-250MCM; 1-250MCM N; 1-#2 AWG GND	
600	600*	- (2 SETS OF) 3-350MCM; 1-#1 AWG GND	(2) 2-1/2"
		Y (2 SETS OF) 3-350MCM; 1-350MCM N; 1-#1 AWG GND	
700	700*	- (2 SETS OF) 3-500MCM; 1-#1/0 AWG GND	(2) 3"
		Y (2 SETS OF) 3-500MCM; 1-500MCM N; 1-#1/0 AWG GND	
800	800*	- (2 SETS OF) 3-600MCM; 1-#1/0 AWG GND	(2) 3"
		Y (2 SETS OF) 3-600MCM; 1-600MCM N; 1-#1/0 AWG GND	
1000	1000*	- (3 SETS OF) 3-400MCM; 1-#2/0 AWG GND	(3) 3"
		Y (3 SETS OF) 3-400MCM; 1-400MCM N; 1-#2/0 AWG GND	
1200	1200*	- (4 SETS OF) 3-350MCM; 1-#3/0 AWG GND	(4) 3"
		Y (4 SETS OF) 3-350MCM; 1-350MCM N; 1-#3/0 AWG GND	
1600	1600*	- (5 SETS OF) 3-400MCM; 1-#4/0 AWG GND	(5) 3"
		Y (5 SETS OF) 3-400MCM; 1-400MCM N; 1-#4/0 AWG GND	
2000	2000*	- (6 SETS OF) 3-400MCM; 1-250MCM GND	(6) 3"
		Y (6 SETS OF) 3-400MCM; 1-400MCM N; 1-250MCM GND	
DESIGNATIONS			
THE ASTERISK ABOVE IS FILLED IN WITH ONE OR MORE OF THE FOLLOWING DESIGNATIONS ON THE ONE LINE DIAGRAM.			
Y - THREE PHASE FOUR WIRE FEEDER K - THREE PHASE FEEDER WITH OVERSIZED NEUTRAL G - THREE PHASE FEEDER WITH ISOLATED GROUND			
NOTES:			
1. ALL AMPACITIES ARE BASED ON 75°C TEMPERATURE RATING OF A COPPER CONDUCTOR AS LISTED IN THE NATIONAL ELECTRIC CODE.			

REMOVALS WORK

EXISTING MAIN SWITCHBOARD DISTRIBUTION SECTION <u>MSB1</u> SCHEDULE													
208Y/120V, 3 PHASE, 4 WIRE PANELBOARD MOUNTING: SWITCHBOARD							3 PHASE LINE BUS: 2500A NEUTRAL BUS: 2500A MAIN FUSED BOLTED PRESSURE SWITCH: 2500A SCCR: 65kA						
Description	# of Parallels	Wire	Ground	Conduit	Frame	Trip	Ckt #	PH-A	PH-B	PH-C	Ckt #	Notes	
RPTV					100	60	1				1		
NE					100	100	2				2		
DIMMER PANEL					100	100	3				3		
RPCR					100	100	4				4		
SPACE					250		5				5		
DP/2					250	225	6				6		
DP/3					250	225	7				7		
ELEVATOR					250	125	8				8	Recircuit Elevator to Panel SB-PP	
LP/C					250	225	9				9		
LP/A					250	225	10				10		
DP/4					250	225	11				11		
DP/1					250	225	12				12		
KP/1 & KP/1A					250	225	13				13		
LP/D & LP/F					250	225	14				14		
SPARE					250	225	15				15		
LP/B					250	225	16				16		
SPACE					400		17				17		
DP/3					400	300	18				18		
PPBR					400	300	19				19		
ACCU-2 (ROOF)					400	300	20				20		
ACCU-1 (ROOF)					400	350	21				21		
ACCU-3 (ROOF)					400	350	22				22		
							total-A	total-B	total-C				
							0	0	0				
TOTAL CONNECTED LOAD:							0	VA	=	0	AMPS		
TOTAL DESIGN LOAD:							0	VA	=	0	AMPS		

NEW WORK

EXISTING MAIN SWITCHBOARD DISTRIBUTION SECTION <u>MSB1</u> SCHEDULE												
208Y/120V, 3 PHASE, 4 WIRE PANELBOARD MOUNTING: SWITCHBOARD							3 PHASE LINE BUS: 2500A NEUTRAL BUS: 2500A MAIN FUSED BOLTED PRESSURE SWITCH: 2500A SCCR: 65kA					
Description	# of Parallels	Wire	Ground	Conduit	Frame	Trip	Ckt #	PH-A	PH-B	PH-C	Ckt #	Notes
RPTV					100	60	1				1	
SPARE					100	100	2				2	
DIMMER PANEL					100	100	3				3	
RPCR					100	100	4				4	
SPACE					250		5				5	
DP/2					250	225	6				6	
DP/3					250	225	7				7	
SPARE					250	125	8				8	
LP/C					250	225	9				9	
LP/A					250	225	10				10	
DP/4					250	225	11				11	
DP/1					250	225	12				12	
KP/1 & KP/1A					250	225	13				13	
LP/D & LP/F					250	225	14				14	
SPARE					250	225	15				15	
LP/B					250	225	16				16	
SPARE					400	400	17				17	
DP/3					400	300	18				18	
PPBR					400	300	19				19	
ACCU-2 (ROOF)					400	300	20				20	
ACCU-1 (ROOF)					400	350	21				21	
ACCU-3 (ROOF)					400	350	22				22	
							total-A	total-B	total-C			
							0	0	0			
TOTAL CONNECTED LOAD:							0	VA	=	0	AMPS	
TOTAL DESIGN LOAD:							0	VA	=	0	AMPS	

EXISTING PANEL LEGEND:

	NEW
	EXISTING TO REMAIN
	REMOVE EXISTING
	RECIRCUIT TO PANEL SB-PP

NOTES:

- 1 - PROVIDE HACR TYPE CIRCUIT BREAKER
2 - PROVIDE LOCKING CLIPS
3 - PROVIDE MEANS OF LOCKING CIRCUIT BREAKER IN OFF POSITION
4 - VERIFY POWER REQUIREMENTS FOR ACTUAL EQUIPMENT BEFORE INSTALLATION
5 - PROVIDE GFCI CIRCUIT BREAKER
6 - PROVIDE AFCI CIRCUIT BREAKER
7 - PROVIDE DUAL FUNCTION CIRCUIT BREAKER
8 - CIRCUIT CONTROLLED VIA TIMECLOCK

CIRCUITING NOTES:

- N - Reconnect existing circuit from Panel NE to Panel SB-PP.
A - Existing circuit from Panel LP/A recircuit to Panel SB-PP.
B - Existing circuit from Panel LP/B recircuit to Panel SB-PP.
C - Existing circuit from Panel LP/C recircuit to Panel SB-PP.
D - Existing circuit from Panel LP/D recircuit to Panel SB-PP.
E - Existing circuit from Panel LP/E recircuit to Panel SB-PP.
F - Existing circuit from Panel LP/F recircuit to Panel SB-PP.
G - Existing circuit from Panel LP/G recircuit to Panel SB-PP.
K - Existing circuit from Panel KP/1 recircuit to Panel SB-PP.
BR - Existing circuit from Panel PPBR recircuit to Panel SB-PP.
P1 - Existing circuit from Panel DP/1 recircuit to Panel SB-PP.
P2 - Existing circuit from Panel DP/2 recircuit to Panel SB-PP.
P4 - Existing circuit from Panel DP/4 recircuit to Panel SB-PP.
M - Existing circuit from switchboard distribution section MSB1.1 recircuit to Panel SB-PP.
X - Existing circuit panel unknown. Contrator shall determine in field.

STANDBY GENERATOR
INSTALLATION AT COS
COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: N.T.S.	APPROVED BY: RS	DRAWN BY: L.C.
DATE: June 25, 2025	CHECKED BY:	EL

ELECTRICAL PANEL
SCHEDULES

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.003	DRAWING NUMBER: E-400
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EXISTING TO BE REMOVED PANEL <u>NE</u> SCHEDULE																				
208Y/120V, 3 PHASE, 4 WIRE PANELBOARD																				
BRANCH POLES: 30 POLE																				
MOUNTING: SURFACE																				
3 PHASE LINE BUS: 100A																				
NEUTRAL BUS: 100A																				
MAIN CIRCUIT BREAKER: 100A																				
SCCR: 10KA																				
Description	Notes	Wire	Ground	Conduit	BRKR	Pole	PH-A	PH-B	PH-C	Pole	BRKR	Conduit	Ground	Wire	Notes	Description				
Fire Alarm Panel		12	12	1/2"	20A	1				2	30A	1/2"	10	10		EM Lighting Inverter (Cafe)				
FA Power Supply		12	12	1/2"	20A	3				4						Existing Branch Circuit				
Security Panel		12	12	1/2"	20A	5				6	20A	1/2"	12	12		FA				
Space						7				8	20A	1/2"	12	12		Boiler Rm Lites				
Space						9				10	20A	1/2"	12	12						
Compressor (Unused)	6	10	1"	60A	11					12	30A	1/2"	10	10		Boiler 2				
					13					14										
					15					16	40A	3/4"	10	8		EM Lighting Inverter (Switchgear Rm)				
Space					17					18						FA				
Spare				15A	19					20	20A	1/2"	12	12		Boiler 1				
					21					22	30A	1/2"	10	10						
					23					24										
Pumps #3 & #4	6	10	1"	60A	25					26										
					27					28	60A	1"	10	6		Pumps #1 & #2				
					29					30										
total-A							total-B			total-C										
0							0			0										
TOTAL CONNECTED LOAD:							0			0			AMPS							
TOTAL DESIGN LOAD:							0			0			AMPS							

NEW STANDBY POWER PANEL SB-PP SCHEDULE														3 PHASE LINE BUS: 600A NEUTRAL BUS: 600A MAIN CIRCUIT BREAKER: 600A SCCR: 42KA IR: 42kA			
208Y/120V, 3 PHASE, 4 WIRE PANELBOARD BRANCH POLES: 84 POLE MOUNTING: SURFACE (HINGED) PROVIDE PANEL MOUNTED TVSS 200kA																	
Description	Notes	Wire	Ground	Conduit	BRKR	Pole	PH-A	PH-B	PH-C	Pole	BRKR	Conduit	Ground	Wire	Notes	Description	
Elevator	M	1	6	1-1/2"	125A	3	8983 1 3362	8983 1 3362		2						Hot Water Pump 1 & 2	
Generator Battery Charger		12	12	1/2"	20A	5	444 1 3362		8983 1 3362	4	60A	1"	10	6	N		
Generator Block Heater		12	12	1/2"	20A	9		1500 1 3362		6						Hot Water Pump 3 & 4	
Generator Strip Heaters		12	12	1/2"	20A	11			200 1 3362	12							
EM Lighting Inverter (Switchgear Rm)	N	8	10	3/4"	40A	13	3754 2770	3754 2770		14	30A	1/2"	10	10	N	Boiler 1 & Boiler Pump 1	
EM Lighting Inverter (2nd Floor IT Closet)	N	10	10	1/2"	30A	17	3131 2770		3130 2770	18	30A	1/2"	10	10	N	Boiler 2 & Boiler Pump 2	
EM Lighting Inverter (2nd Floor IT Closet)	E	10	10	1/2"	30A	21		2392 3600		22	30A	1/2"	10	10	E	2nd Fir IT Rack UPS	
Stage ADA Lift	C	12	12	1/2"	15A	25	576 1020			2392 3600	24	30A	1/2"	10	E	2nd Fir IT Rack UPS	
Elev. Lighting	B	12	12	1/2"	15A	27		500 1020		26	20A	1/2"	12	12	N.2	Fire Alarm	
Elev. Recall	B	12	12	1/2"	15A	29			500 1020	28	20A	1/2"	12	12	N.2	Fire Alarm	
Elev. Pit Receptacle	B	12	12	1/2"	15A	31	360 1020			30	20A	1/2"	12	12	N.2	Fire Alarm	
Elev. Pit Lighting	B	12	12	1/2"	15A	33		500 150		32	20A	1/2"	12	12	N.2	Fire Alarm	
Elev. Shunt Trip	B	12	12	1/2"	15A	35			50 1000	34	20A	1/2"	12	12	N.2	AOR System	
Kitchen Refrigerator	K.5	12	12	1/2"	20A	37	1440 1000			36	20A	1/2"	12	12	N.2	Security Panel	
Kitchen Refrigerator	K.5	12	12	1/2"	20A	39		1356 1000		38	20A	1/2"	12	12	BR	Boiler Rm BPS Panel	
Kitchen Freezer	K.5	12	12	1/2"	20A	41			1440 480	40	20A	1/2"	12	12	BR	Boiler Rm Lighting	
Kitchen Freezer	K.5	12	12	1/2"	20A	43	1776 480			42	20A	1/2"	12	12	P4	Boiler Rm Unit Heaters	
Spare					20A	45			240	44	20A	1/2"	12	12	P4	Gym Mech PH Unit Heat	
Spare					20A	47				46	20A	1/2"	12	12	P4	Gym Storage Rm Unit Heat	
Spare					20A	49		480		48	20A	1/2"	12	12	X	West Mech PH Unit Heat	
Spare					20A	51				50	20A	1/2"	12	12	X	East Mech PH Unit Heat	
Spare					20A	53				52	20A	1/2"	12	12	A	Sprinkler Rm Unit Heat	
Spare					20A	55				54	20A					Spare	
Spare					20A	57				56	20A					Spare	
Spare					20A	59				58	20A					Spare	
Spare					20A	61				60	20A					Spare	
Spare					20A	63				62	20A					Spare	
Spare					20A	65				64	20A					Spare	
Spare					20A	67				66	20A					Spare	
Spare					20A	69											

252 East Avenue
Norwalk, CT 06855
(203) 866-4626 Tel
(203) 866-8019 Fax

[illegible]

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.0023	DRAWING NUMBER: E-401
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GENERATOR SET SCHEDULE (PRE-PURCHASED BY OWNER)

TAG	VOLTAGE	Ø	KW	KVA	PF	FUEL	EMERGENCY/ STANDBY	PRIME / CONTINUOUS / STANDBY	TEMP. RISE	AVERAGE SPL (dBA) AT 23'	OUTPUT CONNECTION			MANUFACTURER & MODEL
											OCP	FEEDER SIZE	LOAD	
G1-SB	208Y/120V	3	150kW	187.5kW	0.8	NATURAL GAS	STANDBY	STANDBY	130°C	71dBA	600A-3P	(2 SETS OF) 3-350MCM, 1-350MCM N & 1-#1 G IN 2-1/2" PVC	ECB-SB	REHLKO (FORMERLY KOHLER) KG150 (GENERATOR) 4S13X (ALTERNATOR)

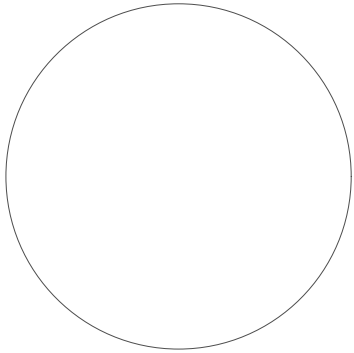
AUTOMATIC TRANSFER SWITCH SCHEDULE (PRE-PURCHASED BY OWNER)

TAG	VOLTAGE	AMPS	Ø	NEUTRAL	NORMAL CONNECTION			EMERGENCY CONNECTION			LOAD CONNECTION		MANUFACTURER & MODEL
					PANEL/CKT	OCP	FEEDER SIZE	PANEL/CKT	OCP	FEEDER SIZE	PANEL	FEEDER SIZE	
ATS-SB	208Y/120V	600A	3	SWITCHED	ECB-N	600A-3P	(2 SETS OF) 3-350MCM, 1-350MCM N & 1-#1 G IN 2-1/2"C	GENERATOR G1-SB OUTPUT CIRCUIT BREAKER	600A-3P	(2 SETS OF) 3-350MCM, 1-350MCM N & 1-#1 G IN 2-1/2"C	SB-PP	(2 SETS OF) 3-350MCM, 1-350MCM N, & 1-#1 G IN 2-1/2"C	SCHNIEDER ELECTRIC ASCO J03ATS30600CGXF + 11BE

ENCLOSED CIRCUIT BREAKER SCHEDULE

TAG	VOLTAGE	AMPS	Ø	NEUTRAL	IR	TRIP UNIT	LINE CONNECTION		LOAD CONNECTION		BASIS OF DESIGN MANUFACTURER & MODEL
							EQUIPMENT	FEEDER SIZE	EQUIPMENT	FEEDER SIZE	
ECB-SB	208Y/120V	600A	3	100%	65kA	LSI	G1-SB	(2 SETS OF) 3-350MCM, 1-350MCM N, & 1-#1 G IN 2-1/2"C	ATS-SB (EMEGENCY)	(2 SETS OF) 3-350MCM, 1-350MCM N, & 1-#1 G IN 2-1/2"C	SCHNIEDER ELECTRIC SQUARE D LGL36600U33X L600AWK
ECB-N	208Y/120V	600A	3	100%	65kA	LSI	MSB1.1	(2 SETS OF) 3-350MCM, 1-350MCM N, & 1-#1 G IN 2-1/2"C	ATS-SB (NORMAL)	(2 SETS OF) 3-350MCM, 1-350MCM N, & 1-#1 G IN 2-1/2"C	SCHNIEDER ELECTRIC SQUARE D LGL36600U33X L600AWK

	06-25-2025	ISSUED FOR BID
	06-06-2025	ISSUED FOR PROGRESS
REV	DATE	DESCRIPTION



STANDBY GENERATOR
INSTALLATION AT COS
COB SCHOOL

Cos Cob School
300 E Putnam Aveune
Greenwich, CT 06807

SCALE: N.T.S.	APPROVED BY: RS	DRAWN BY: L.C.
DATE: June 25, 2025	CHECKED BY:	EL

ELECTRICAL SCHEDULES

BID NUMBER: 2534-25	LFG JOB NUMBER: 2025.LFG.003	DRAWING NUMBER: E-402
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