

IPSWICH ELECTRIC LIGHT DEPARTMENT (“IELD”)

CONTRACT DOCUMENTS

FOR

FOWLER’S LANE #5 SUBSTATION UPGRADE PROJECT

July 8, 2026

TABLE OF CONTENTS

	<u>Section</u>
<hr/>	
<u>Contract Documents</u>	
Invitation to Bid	A
Information and Instructions to Bidders	B
Bid Form	C
Price Sheet (Appendix A)	
Bidder Qualification Form (Appendix B)	
Certificate of Vote (Appendix C)	
Specifications	D
Agreement	E
Sample Payment Bond	F
Insurance Requirements	G
Terms and Conditions	H
Prevailing Wage Schedule	I
 FAQ's and Bidder Checklist	

SECTION A
INVITATION FOR BIDS

IFB July 8, 2026

Pursuant to M.G.L. c. 30, § 39M, the Ipswich Electric Light Department (IELD) solicits sealed bids for:

FOWLERS LANE #5 SUBSTATION UPGRADE PROJECT

The work involves the provision of labor, materials, supervision, vehicles, equipment, and materials, and related work required to upgrade existing relays and to extend equipment controls and relays as set forth in the specifications. The work will be performed at IELD's substation yard located at Fowlers Lane, Ipswich, MA.

Bid documents may be obtained by contacting Anthony Calascubetta by email at _acalascibetta@ipswichutilities.org.

A Pre-Bid conference and site visit will be held on June 25, 2026 at 10:00 AM. Attendance is strongly encouraged.

Bids shall be submitted in duplicate in a sealed envelope marked, "**FOWLERS LANE #5 SUBSTATION UPGRADE PROJECT, IFB July 8, 2026.**" All bids shall be accompanied by a bid deposit in the form of cash, a bid bond, a certified check, treasurer's or a cashier's check issued by a responsible bank or trust company payable to "Ipswich Electric Light Department" in the amount of five (5) percent of the lump sum price. The bid deposit must be submitted in a separate, sealed envelope, marked "Bid Deposit." No bidder may withdraw its bid for a period of sixty (60) days, excluding Saturdays, Sundays, and legal holidays, after the date of opening bids.

The work is subject to prevailing wage laws. Attention is directed to the minimum wage rates to be paid as determined by the Commissioner of Labor and Workforce Development and the weekly payroll record submittal requirements under the provisions of M.G.L. c. 149, §§ 26 -27D inclusive.

IELD will receive sealed bids until 10:00 AM, July 8, 2026, at 272 High Street, Ipswich, MA 01938, ATTN: Dylan Lewellyn, at which time bids will be opened and read aloud. Bids received after the deadline and/or without the required bid deposit will not be accepted.

IELD reserves the right to reject any and all bids, waive minor irregularities and informalities, and to take such action as it deems to be in the public interest.

No award shall be final until IELD executes the agreement signed by a duly authorized representative.

SECTION B

INFORMATION AND INSTRUCTIONS TO BIDDERS

1. Receipt and Opening of Bids

Pursuant to M.G.L. c. 30, § 39M, the Ipswich Electric Light Department (“IELD”) seeks sealed bids for the installation of conduits, foundations, electric equipment, and related work at its substation to upgrade the existing 23 kV relay panels and to extend the equipment controls and relays to the control house. The original and one copy of the bid shall be submitted in a sealed envelope, addressed to the Ipswich Electric Light Department, 272 High Street, Ipswich, MA 01938, ATTN: Dylan Lewellyn and marked “**FOWLERS LANE #5 SUBSTATION UPGRADE PROJECT**”, **IFB July 8, 2026.**”

Bids must be received no later than 10:00 AM, Tuesday, July 8, 2026.

Any bid may be withdrawn or modified prior to the deadline for the opening of bids. Any bid received after the deadline will not be considered. The bidder agrees that its bid shall be good and may not be withdrawn for a period of 60 days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids.

2. Description and Location and Work

IELD is a municipal light plant providing electric services to customers in the Town of Ipswich, MA. The work consists of the provision of labor, materials, vehicles, and services in connection with the upgrades to the existing relays and to extend equipment controls and relays at the IELD Fowler’s Lane substation (“Work”). The Work shall include mobilization and demobilization, foundations, crushed stone surfacing, installation of above-ground and below-grade conduit systems, fabrication and erection of 25 KV VT & switch structure, installation of a 15 kV circuit breaker, 15 kV manually operated Hookstick switch, 25 kV voltage transformer, cable jumpers, insulators, and fittings and removal of existing bus sections. All work will be performed in the substation yard

The planned construction schedule is:

- October 12, 2026 – Begin Construction. Fowlers Lane will be de-energized for a 7 AM start.
- October 28, 2026 – Complete underground construction.
- November 3, 2026 – Project completion.

The contractor will complete all work on this project by November 9.

The location, general characteristics, and principal details of the Work are set forth in Section D, SPECIFICATIONS.

The Bidder shall furnish all labor, services, supervision, vehicles, materials (unless otherwise provided in the Specifications), equipment, plant, machinery, apparatus, appliances, tools,

supplies, and all other things necessary to do all work required for the completion of each item of the work and as herein specified.

The work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

A Pre-Bid Conference and Site Visit will be held at:

Time: 10:00 AM

Date: June 25, 2026

Location: 20 Fowlers Lane, Ipswich MA 01938

Attendance is strongly encouraged. Contact Anthony Calascibetta <acalascibetta@ipswichutilities.org> to register.

3. Preparation of Bid

Each bid must be submitted on the prescribed forms. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures. All documents must be completed, and where required, documents must be signed by an authorized person. Information currently on file with the IELD will not relieve the Bidder from submitting all required forms and information. Do not submit any pricing or other information not requested in this Invitation for Bids (“IFB”). The submission of extraneous information may render the bid non-compliant and subject to rejection.

The person signing the bid must initial any change or strikeout to the response, but any changes or strikeouts to the provisions of the IFB may render the bid non-responsive and subject to rejection. The bid shall include an acknowledgment of receipt of all addenda, the numbers of which must be filled in on the BID FORM, Section C.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above.

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

Bidders are expected to read all sections of this IFB and deliver bid in accordance with these Instructions. By submitting a bid, the bidder accepts all terms and conditions, specifications and requirements of the Contract Documents and represents and warrants that all information provided is true and accurate to the best of the bidder’s knowledge at the time of submission.

IELD shall not be responsible for completeness or accuracy of any bid documents obtained from third party sources, plan rooms, etc.

4. Signatures

Bids must be signed in the designated space on the Bid Form. Bids signed by an agent must be accompanied by written proof of the agent's authority to sign the bid and bind the bidder.

Bids submitted by corporations must be executed in the corporate name by the president, a vice president, or other corporate officer accompanied by evidence of authority to sign (see Certificate of Vote), and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature. Evidence of authority to conduct business as an out-of-state corporation in the Commonwealth of Massachusetts shall be provided. State contractor license number, if any, must also be shown.

Bids submitted by partnerships must be executed in the partnership name and signed by a partner whose title must appear under the signature. The official address of the partnership must be shown below the signature.

Bids submitted by limited liability companies (LLCs) must be executed by a manager or member.

All names must be typed or printed in ink below the signature.

UNAUTHORIZED SIGNATURES ARE CAUSE FOR THE BID BEING DEEMED NON-RESPONSIVE, AND THEREFORE, REJECTED.

5. Contact Information

Bidders must provide the name, title, address, telephone number and e-mail address, of a contact person to whom questions and requests for clarification may be addressed.

6. Pricing

Bidders shall provide a Lump Sum Price for all Work as set forth in the Specifications, Section D. The Lump Sum Price shall include all labor, equipment, materials, tools, services, transportation, deliveries, required bonds, excavation and site preparation work, mobilization and demobilization, applicable taxes, fees, and other expenses, including travel, lodging, rentals, shipping, handling, and administrative expenses, downtime (if any), and profit. Material shall be shipped FOB Ipswich Massachusetts, freight prepaid and allowed. IELD is a tax-exempt entity; pricing shall not include sales and use taxes. Conforming bids will be compared and awarded based on the Lump Sum Price for such Work.

Unless otherwise indicated in the bid documents, all prices bid shall be firm fixed pricing for the duration of the contract.

7. Substitute and "Or Equal" Items

Whenever a manufacturer's name, part number, or style designation is used, the intent is not to be restrictive but solely to indicate the type and quality of merchandise required. When submitting a bid for substitute "or equal" items, bidders shall provide written certification that parts offered meet manufacturer's or industry standards. Materials that do not, in the opinion of IELD, meet specified requirements will not be accepted. Bidders must provide a written warranty statement for alternate materials offered.

8. Prevailing Wages

Prevailing Wage Rates as determined by the Department of Labor Standards pursuant to M.G.L. c. 149, §§ 26 - 27G, apply to the work. It is the responsibility of the bidder, before bid opening, to request, if necessary, any additional information on Prevailing Wage Rates for those tradespersons who may be employed for the proposed work.

Prevailing wage rates for this project are included in Section I, PREVAILING WAGE SCHEDULE.

Copies of Payroll Record and Statement of Compliance forms may be found at www.mass.gov/dos/pw.

9. Bid Deposit

Each bid must be accompanied by bid deposit in amount of five (5) percent of the LUMP SUM PRICE in the form of a certified check, a bid bond, cash, or cashier's check payable to IELD. Bid security shall be enclosed in a separate envelope clearly marked "Bid Deposit" and attached to the bid. Bid deposits will be returned to all except the three lowest responsible and eligible bidders within five (5) days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining deposits will be returned promptly after the execution of the Agreement, or if no Agreement is executed, after the deadline for accepting bids has expired.

10. Bid Procedure

The following list of requirements shall apply to each filed bid. Bids not meeting all the requirements for timeliness and security will be rejected without opening; bids not meeting signature and addenda requirements will be rejected prior to checking bid amounts.

Bids shall be submitted at the place and before the time specified in Receipt and Opening of Bids, above.

Properly executed bid security shall be placed in a sealed envelope and shall be attached to the outside of the envelope containing the bid as described above.

Bid signatures will be checked.

All addenda will be sent by email to all prospective bidders as provided in paragraph 13. All bidders shall acknowledge receipt of all Addenda on Section C, BID FORM.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further review. All those present at the bid opening may examine all bids after the bid opening and reading.

11. Ability and Experience of Bidder

Bidders must complete the Bidder Qualification Form provided in the bid package (Appendix B to the Bid Form). The information should be based on direct experience with Work contained in this IFB. Bidders must meet and submit the following minimum qualifications and experience:

- The bidder must have 10 years of experience performing similar work. The bidder also must have been in business continually for a period of 10 years;
- The bidder must possess all required licenses, registrations, and permits to perform the work and operate required equipment and vehicles in the Commonwealth of Massachusetts;
- The bidder must have completed at least five(5) similar projects in the past five (5) years. The bidder must provide a work reference for each project and shall describe each project in detail including dollar size as well as start and completion dates. (See Bidder Qualification Form);
- The bidder must submit the name, address, qualifications and work experience (*e.g.*, brief resume) of key personnel who will be assigned to perform work under the contract. Include all licenses, registrations and permits held;
- The bidder must submit the list of major equipment for use on this project. Information should include; equipment type, model year and ownership/lease.
- The bidder must provide the names and contact information for a minimum of three (3) current clients, preferably municipalities and utilities. Include the name, address, phone number, and/or email of the person who may be contacted for a reference.
- The bidder shall provide a proposed construction schedule to demonstrate its ability to perform the work in a timely manner. Once the contract is awarded, final construction schedules and the coordination of Work shall be subject to IELD's review and approval.

No award will be made to any bidder who cannot satisfy to IELD that it has sufficient ability and experience in this class of work and sufficient capital and resources to enable it to prosecute and complete the work successfully within the times specified. IELD's decision or judgment on these matters will be final, conclusive, and binding.

IELD may make such investigations as it deems necessary, and the bidder shall furnish to IELD, under oath if so required, all such information and data for this purpose as IELD may request.

12. Conditions of Work

Each bidder must familiarize himself fully with the conditions relating to the performance of the work in IELD's service territory and the employment of labor thereon. Failure to do so will not relieve a successful bidder of its obligation to furnish all material and labor necessary to carry out the provisions of the contract. Insofar as possible, the contractor in carrying out its work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor and shall work cooperatively with IELD work crews.

13. Addenda and Interpretations

No interpretation of the meaning of specifications or other bid documents will be made to any bidder orally. All information given to bidders other than by means of plans, specifications, or addenda, as described below, is given informally and shall not be used as the basis of a claim against IELD.

Every request for such clarification, interpretation, or modification must be in writing and directed to: **Anthony Calascibetta <acalascibetta@ipswichutilities.org>**Ipswich Electric Light Department (IELD), 272 High Street, Ipswich, MA 01938. **Requests may be sent by email at: Anthony Calascibetta <acalascibetta@ipswichutilities.org>**. In order to receive consideration, such request must be received at least five (5) business days prior to the deadline for opening of bids. Any and all such interpretations, supplemental instructions or changes to the IFB will be in the form of written addenda which, when issued, will be sent to all prospective bidders of record (at the respective email address furnished by them for such purposes), not later than three (3) days prior to the deadline for the opening of bids. Failure of any bidder to receive any such addendum shall not relieve such bidder from any obligation under its bid as submitted. All addenda so issued shall become part of the Contract Documents. Post-bid clarifications are not permitted.

14. Payment Bond

In accordance with M.G.L. c. 30, § 39M and M.G.L. c. 149, § 29, the successful bidder shall furnish a payment bond in the amount of 50% of the total contract price (Section C - Bid Form, Paragraph II B), for payment by the contractor and subcontractors for labor performed or furnished and materials used or employed therein as specified in Section G (Payment Bond) and Section H (Terms and Conditions). The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to IELD. The bond shall remain in force for one year after final acceptance of all work performed under the Agreement, unless IELD, in writing, releases the contractor from the obligation sooner. The Payment Bond shall be provided within 10 days of the notification of contract award.

15. Power of Attorney

Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

16. Laws and Regulations

Attention is directed to the fact that all applicable federal and state laws, municipal ordinances, and the rules and regulations (“Laws”) of all authorities having jurisdiction over the procurement and performance of work shall apply to the contract throughout, and such Laws will be deemed to be included in the contract the same as though herein written out in full.

17. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon its failure or refusal to execute and deliver the Agreement and the payment bond within ten (10) days after receiving notice of the acceptance of its bid, shall forfeit to IELD, as liquidated damages for such failure or refusal, the bid deposit furnished with its bid. In case of death, disability, *bona fide* and obviously clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, its bid deposit will be returned. Clerical errors shall not include errors in calculating applicable rates or the bidder’s expected profit.

18. Obligation of Bidder

At the time of the opening of bids, each bidder will be presumed to have read and to be thoroughly familiar with the Contract Documents, including all addenda. The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of its bid.

19. Right to Reject Bid

To the extent permitted by law, IELD reserves the right to reject any and all bids should IELD deem it to be in the public interest to do so.

IELD shall reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain exceptions, additions or clarifications not called for, erasures not properly initialed, alterations, or similar irregularities. Provided however, IELD, in its discretion, may waive non-statutory minor informalities to the extent permitted by law.

IELD also reserves the right to reject the bid of any bidder that IELD considers to be not responsive or otherwise unqualified based on the criteria set forth herein.

20. Comparison of Bids

Bids will be compared based the LUMP SUM PRICE on the Bid Form.

In the event that there is a discrepancy between the words and figures stated on the Bid Form, the prices written in words will govern.

21. Award of Contract

The Contract will be awarded to “the lowest responsible and eligible bidder” pursuant to M.G.L. c. 30, § 39M. Such a bidder shall possess the skill, ability and integrity necessary for the faithful performance of the work, shall be able to furnish labor that can work in harmony with all other elements of labor employed, or to be employed, in the work, and shall otherwise comply with all applicable provisions of law.

Bidders may be asked to validate qualifications to fulfill the bid requirements specified by submitting detailed evidence such as financial data, previous experience, present commitments and other such data as applicable.

Clarity and completeness of bid along with results of reference and credit checks will be taken into consideration in determination of responsible and eligible bidders.

The term “lowest responsible and eligible bidder” is defined under M.G.L. c. 30, § 39M as follows:

“The bidder:

- (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work;
- (2) who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
- (3) who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the U.S. Occupational Safety and Health Administration (OSHA) that is at least (ten) 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee;
- (4) who, where the provisions of section 8B of Chapter 29 apply, shall have been determined to be qualified thereunder; and
- (5) who obtains within ten (10) days of the notification of contract award the security by bond required under section 29 of Chapter 149; provided that for the purposes of this section the term “security by bond” shall mean the bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority; and provided further; that if there is more than one surety company, the surety companies shall be jointly and severally liable. [M.G.L. c.30 § 39M(c)].”

Responses to, and results of reference checks or submitted information, and information obtained from other sources can be used to determine bidder responsibility and may be cause for rejection of any bid.

See paragraph 20 (Comparison of Bids) for a description of how the low bid will be determined.

If two or more responsible and eligible bidders have submitted the same bid price, there will be a ‘second heat’ of bidding between the tied bidders. The tied vendors will be contacted and advised that their bid prices were tied and invited to submit a second sealed bid for the same contract by a specified date and time.

22. Grounds for Disqualification

The following, without limitation, are some of the causes that may be considered as sufficient for the disqualification of a bidder and the rejection of their bid:

- a. More than one bid for the same work from an individual, firm, partnership or corporation;
- b. Evidence of collusion among bidders;
- c. Poor performance in the execution of work under a previous contract or contracts;
- d. Failure to achieve reasonable progress on existing contract;
- e. Default on previous contracts or failure to execute contract documents after award;
- f. Failure to supply bid bond, certified check or cashier's check as bid security;
- g. Failure to fully complete Bid Form and submit required information and attachments; or
- h. The Inclusion of conditions, clarifications or qualifiers regarding amounts, prices, terms, or specifications. Bids must be accepted based on the pricing, terms, and specifications in this IFB. Exceptions or deviations are not permitted. Changes to the scope of work or additional pricing only are permitted through the execution a change order as allowed by this IFB and applicable Laws.

23. Statutes Regulating Competitive Bidding

M.G.L. c. 30, § 39M governs this bid process. Bidders shall be responsible for familiarizing themselves with all statutory requirements and any rules and interpretations established by the courts and/or the Attorney General Office's Bid Unit thereunder. Any bid which does not comply M.G.L. c. 30, § 39M shall be rejected. Pricing, terms and conditions, and other material aspects of the IFB are not negotiable or waivable or subject to discussion with individual bidders. Exceptions may not be taken in the bid submission and only may be entertained through the request for clarification/modification process prior to the deadline. By law, IELD only has the authority to waive minor informalities in the submitted bids, which IELD may exercise in its discretion. M.G.L. c. 30, § 39M is a competitive bid process, not a proposal process. Accordingly, bidders shall not furnish any information that has not been requested. The submission of extraneous information and materials may be grounds for rejection.

24. Contractor Records

The successful bidder shall comply with the provisions of M.G.L. c. 30, § 39R concerning contractor records.

25. Insurance

The successful bidder shall carry, and continuously maintain through the completion of the contract, insurance as specified in Section G, Insurance Requirements, and in such form as shall protect the Contractor and IELD and its employees, agents and officials, from all claims and liability for damages for bodily injury, including accidental death, and for property damage, which may arise from operations under the Contract Documents. The successful bidder covenants and agrees to hold IELD and its employees, agents and officials harmless from loss or damage due to claims for personal injury and/or property damage arising from, or in connection with operations under the contract.

SECTION C

BID FORM

Bid of _____ (hereinafter called "Bidder")*

() a corporation, organized and existing under the laws of the state of _____

() a partnership

() a joint venture

() an individual
doing business as _____

To Ipswich Electric Light Department ("IELD" or "Owner"):

The Bidder, in compliance with the Invitation for Bids (or "IFB") for the "**FOWLER'S LANE #5 SUBSTATION UPGRADE PROJECT**", **IFB July 8, 2026**, having examined the specifications, terms and conditions, and all related documents, and being familiar with nature, locations and conditions of the work, including the availability of materials and labor, hereby proposes to furnish all labor, materials, vehicles, equipment and supplies as set forth in the specifications, and to perform the work in accordance with the Contract Documents at the prices stated below. The prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this bid is a part.

*Insert corporation, partnership or individual as applicable.

I. BIDDER REPRESENTATIONS

In submitting this bid, the Bidder represents that:

1. Bidder has examined copies of all the Contract Documents as defined in the IFB, including the following Addenda (Acknowledge receipt by entering Addendum number and date below.)

<u>ADDENDUM NUMBER</u>	<u>DATE</u>
_____	_____
_____	_____
_____	_____

2. Bidder is familiar with the nature and extent of the Contract Documents and the work, associated documents, goods, special services, and all local conditions, laws, and regulations that may affect cost, progress, or furnishing of the goods or services.

II.CONTRACT PRICE:

A. The Bidder agrees to furnish all work as set forth in the Specifications, Section D, at the following **Lump Sum Price:**

\$ _____ \$ _____
(figures) (words)

For bid comparison purposes, the lowest eligible and responsible bidder will be determined based on the Lump Sum Price” above.

B. The Bidder agrees to furnish out-of-scope work and any other additional or revised work agreed-upon and required by a properly executed change order at the following **Unit Prices**. Unit Prices shall include all overhead, profit, and other costs, and will be used for the basis of change orders.

III. BIDDER QUALIFICATIONS

The completed Bidder Qualification Form (Appendix A) and copies of resumes, work experiences, licenses and other requested information are submitted with the Bid Form. The Bidder represents and warrants that all information is true and accurate to the best of its knowledge.

IV. BIDDER ACKNOWLEDGMENTS AND CERTIFICATIONS

The Bidder understands that all bids for work are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including M.G.L. c. 30, § 39M.

The Bidder understands that IELD reserves the right to reject any or all bids and to waive minor informalities in the bidding in accordance with applicable law.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids.

Within 10 days of receipt of the written notice of acceptance of this bid, the Bidder will execute the formal Agreement set forth in Section E, AGREEMENT.

The selected Contractor shall furnish a payment bond in an amount at least equal to fifty percent (50%) of the total contract price, Section II above.

The selected Contractor shall furnish a Certificate of Insurance in accordance with Section G – Insurance Requirements.

A bid deposit is attached in the sum of five percent (5%) of the total bid (Section II above) in accordance with the conditions of Section B, INSTRUCTIONS TO BIDDERS. The bid security may become the property of IELD in the event the Agreement and bond are not executed within the time set forth above.

The undersigned offers the information in the Bidder Qualification Form as evidence of its qualifications to perform the work in accordance with the Contract Documents.

Pursuant to M.G.L. c. 62C, § 49A, I **certify** under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all State Taxes Required under law.

The undersigned hereby **certifies** that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work.

The undersigned hereby **certifies** that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (“OSHA”) of at least 10 hours in duration at the time the employee begins work. The Contractor will furnish documentation of successful completion of said course with the first certified payroll report for each employee.

The undersigned **certifies** under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word “person” shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Respectfully submitted:

Date: _____

By: _____

(Signature)

(Name of Bidder)

(SEAL - if bid is by
a corporation)

(Title)

(Business Address)

(City and State)

(Telephone Number)

(Attach Certificate of Vote, Appendix B, if applicable.)

APPENDIX A
BIDDER QUALIFICATION FORM

BIDDER NAME _____

TIME IN BUSINESS Bidder's organization has been in business continuously from the year _____

EXPERIENCE SERVICE OR CONSTRUCTION SUPPLIERS
Bidder has had experience in similar projects or services as defined in the IFB as a Prime contractor for _____ years and / or as a Subcontractor for _____ years.

PREVIOUS PROJECTS Following is a partial list of the projects that the Bidder's organization, and suppliers have completed that are similar in scope and magnitude to this IFB. Use additional sheets as necessary to include all pertinent information.

PRIME CONTRACTOR

OWNER OR CLIENT (Must Include Contact Name and Phone No.)	CONTRACT AMOUNT	PROJECT DESCRIPTION AND LOCATION (include number and type of meters}	START DATE	END DATE

**PREVIOUS PROJECTS
SUBCONTRACTOR(S)**

Following is a partial list of the projects that the subcontractor’s organization, and suppliers have completed that are similar in scope and magnitude to this IFB. Use additional sheets as necessary to include all pertinent information.

OWNER OR CLIENT (Must Include Contact Name and Phone No.)	CONTRACT AMOUNT	PROJECT DESCRIPTION AND LOCATION (include number and type of meters}	START DATE	END DATE

PROJECT RESOURCES

The following personnel are currently employed by the bidder (prime contractor) and/or subcontractor and available for assignment on the project. **Note: The Prime Contractor’s and Subcontractor’s Project Manager for this project must be included.** Workers must meet the minimum requirements set forth in Section D before commencing the work. If the minimum requirements will not be met at the time of submission of the bid, please explain when such requirement(s) will be met.

ATTACH RESUMES AND HISTORY OF EXPERIENCE TO THIS FORM.

NAME	RESIDENCE ADDRESS	BUSINESS ADDRESS AND PHONE

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PRINCIPALS

Following are the names and addresses of the members of the Board of Directors of the bidding corporation, or the names and addresses of all partners or individuals that have a stake in this bid. (Attach additional sheets as necessary.)

NAME	RESIDENCE ADDRESS	BUSINESS ADDRESS AND PHONE

CREDIT REFERENCES

Provide a list of at least three (3) credit references, including contact name, telephone number. References shall include key suppliers, vendors, and banks

NAME OF REFERENCE	ADDRESS	CONTACT NAME PHONE AND FAX NUMBER

SAFETY RECORD

Following is a list of Safety Citations issued to the bidder within the last 3 years. (Attach additional sheets as necessary.)

CLIENT OR PROJECT	CONTACT NAME AND TELEPHONE	TYPE OF CITATION	ISSUED BY

SETTLEMENT HISTORY

Following is a list of projects undertaken within the last three (3) years which have resulted in partial or final settlement of the contract by arbitration or litigation. (Attach additional sheets as necessary.)

CLIENT OR PROJECT	CONTACT NAME AND TELEPHONE	ORIGINAL CONTRACT AMOUNT	TOTAL CLAIMS	AMOUNT

By signing this statement, the bidder represents and warrants under the pains and penalties of perjury that all information is true and accurate to the best of its knowledge and belief.

Dated at _____ this ___ day of _____, 2026

(Name of Bidder)

(Legal address of Bidder)

By: _____

Title: _____

State of: _____, County of: _____

Being duly sworn, deposes and says that he/she is: _____

(provide name of individual)

of: _____

(provide name of company or corporation and legal address)

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

(Notary Public Seal)

My commission expires: _____

Notary Public Name: _____

Address: _____

APPENDIX B

CERTIFICATE OF VOTE
(to be filed if Contractor is a Corporation)

I, _____, hereby certify that I am (Secretary of the Corporation)
the duly qualified and acting Secretary of _____
(Name of Corporation)

and I further certify that a meeting of the Directors of said Company, duly called and held on
_____, at which
(Date of Meeting)

all Directors were present and voting, the following vote was unanimously passed:

VOTED: To authorize and empower

Anyone acting singly, to execute Forms of Bid, Contracts or Bonds on behalf of the Corporation.

I further certify that the above vote is still in effect and has not been changed or modified in any respect.

By: _____
(Secretary of Corporation)

A True Copy:

Attest: _____
(Notary Public)

My Commission Expires: _____
(Date)

SECTION D

SPECIFICATIONS



ISSUED FOR CONSTRUCTION

REVISION 2

JUNE 5TH, 2026

CONSTRUCTION SPECIFICATION

FOWLER'S LANE #5 – SUBSTATION UPGRADES

Technical Specification TS-001

Project #25337

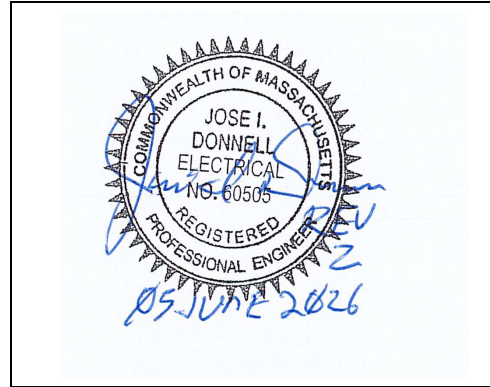
A collage of images related to renewable energy and power infrastructure. It includes a close-up of a high-voltage electrical transmission tower with insulators, a row of solar panels on a grassy hill, a large wind turbine, and a row of smaller wind turbines in the distance over a body of water under a blue sky with clouds.

**EMPOWERING
ENERGY SOLUTIONS**
for the future...today

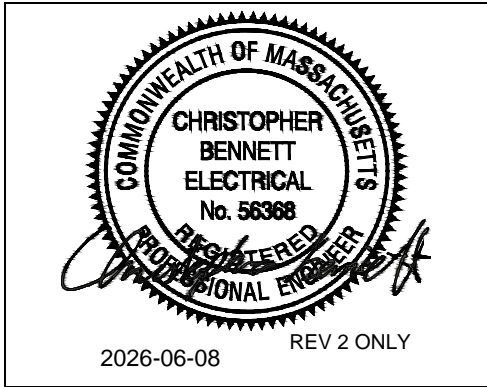
SECTION 00 01 07
SEALS PAGE



Civil & Structural



Electrical



Protection & Controls

END OF SECTION

SECTION 00 01 10
TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

Section 00 01 07	Seals Page
Section 00 01 10	Table of Contents
Section 00 01 15	List of Drawings

DIVISION 01 – GENERAL REQUIREMENTS

Section 01 11 00	Summary of Work
Section 01 31 00	Project Management and Coordination
Section 01 33 00	Submittal Procedures
Section 01 40 00	Quality Requirements
Section 01 42 16	Definitions
Section 01 50 00	Temporary Facilities and Controls
Section 01 77 00	Contract Closeout
Section 01 78 00	Closeout Submittals

DIVISION 03 – CONCRETE

Section 03 30 00	Cast-in-Place Concrete
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DIVISION 05 – METALS

Section 05 12 00	Structural Steel
------------------	------------------

DIVISION 26 – ELECTRICAL

Section 26 05 00	Common Work Results For Electrical
Section 26 11 14/10	Main Electric Supply Station And Substation

DIVISION 33 – UTILITIES

Section 33 71 02	Underground Electrical
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APPENDICES

Appendix A	Geotechnical Report
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END OF SECTION

LIST OF DRAWINGS

PART 1 GENERAL

1.1 SUMMARY

A. This section lists the drawings for the project.

1.2 CONTRACT DRAWINGS

A. Contract drawings are listed as follows:

DRAWING NO.	TITLE
919506-C100-2-ADDITIONS	GENERAL SITE PLAN
919506-C200-2-ADDITIONS	FOUNDATION PLAN
919506-C214-0-ADDITIONS	FOUDATION DETAILS SHEET 5
919506-C300-0-ADDITIONS	STRUCTURAL NOTES
919506-C301-0-ADDITIONS	23kV 3PH VT & DISCONNECT SWITCH STRUCTURE STEEL DETAILS
5-E-7-3-ADDITIONS	CONTROL BUILDING LAYOUT & DETAILS
5-E-7-3-REMOVALS	CONTROL BUILDING LAYOUT & DETAILS
25337 – BOM SUBSTATION MATERIALS	LONG LEAD BILL OF MATERIALS
25337 – RACEWAY FILL & LOADING CALC SHEET	RACEWAY CALCULATIONS
919506-E100-1-ADDITIONS	ELECTRICAL ARRANGEMENT PLAN
919506-E100-1-REMOVALS	ELECTRICAL ARRANGEMENT PLAN
919506-E110-1-ADDITIONS	ELECTRICAL ARRANGEMENT SECTIONS SHEET 1 OF 3

919506-E110-1-REMOVALS	ELECTRICAL ARRANGEMENT SECTIONS SHEET 1 OF 3
919506-E111-ADDITIONS	ELECTRICAL ARRANGEMENT SECTIONS SHEET 2 OF 3
919506-E111-REMOVALS	ELECTRICAL ARRANGEMENT SECTIONS SHEET 2 OF 3
919506-E112-ADDITIONS	ELECTRICAL ARRANGEMENT SECTIONS SHEET 3 OF 3
919506-E112-REMOVALS	ELECTRICAL ARRANGEMENT SECTIONS SHEET 3 OF 3
919506-E113-ADDITIONS	ELECTRICAL ARRANGEMENT DETAILS SHEET 1 OF 1
919506-E202-0-ADDITIONS	ONE LINE DIAGRAM DEVICE DESIGNATIONS
919506-E202-0-REMOVALS	ONE LINE DIAGRAM DEVICE DESIGNATIONS
919506-E450-2-ADDITIONS	CONDUIT & GROUNDING PLAN
919506-E450-2-REMOVALS	CONDUIT & GROUNDING PLAN

1.3 REFERENCE DRAWINGS

- A. The following reference drawings may not be a part of the contract but are included with the drawings for information:

DRAWING NO.	TITLE
N/A	N/A

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 11 00 SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

The work covered under these specifications consists of furnishing all supervision, labor materials and equipment (except for those specifically identified to be provided by others) required to upgrade the existing 23kV relay panels and extend equipment controls and relays into existing substation control house. All work shall meet the requirements of this specification, supporting documentation, industry standards, all local, state, and federal laws, and Contract Documents.

It shall be the Contractor's responsibility to coordinate the work efforts of any and all Subcontractors under their control.

1.2 PROJECT NAME

- A. The project name shall appear on all documentation as follows:
 - 1. Fowler's Lane #5 – Substation Upgrades

1.3 PROJECT SITES

- A. The project site is located at: Fowler's Lane, Ipswich, Massachusetts.

1.4 PROJECT DESCRIPTION

- A. The existing Ipswich Substation is being upgraded. The existing control house will have existing electro-mechanical relay panels replaced with pre-fabricated panels of relays, metering and controls. The control house will have circuit breaker controls, metering and relaying brought inside. Transformer protection and display meters will be updated. 13.8kV bus tie circuit breaker and associated disconnect switches will be installed. Bus PT's for 59N/3V0 will be installed for protection. New tie bus breaker with associated disconnect switches in the future 13BT position will be installed.
- B. The Work of the Project is defined by the contract documents and consists of the following:
 - 1. Substation Construction
 - a. Mobilization and demobilization.
 - b. Temporary facilities.
 - c. Inspections and testing.
 - d. Foundation construction.
 - e. Installation of above and below grade raceway, including, but not limited to, above grade conduits, below grade conduits, and cable trench installation.
 - f. Steel structure fabrication and erection.

- g. Substation equipment and material installation including, but not limited to, circuit breakers, disconnect switches, PTs, arresters, rigid and flexible bus conductors, insulators, etc.

1.5 PERMITS AND LICENSES

- A. Permits Licenses General: Contractor shall obtain all permits associated with construction activities.
- B. Licenses: Contractor shall obtain and pay all licenses associated with construction activities, such as business licenses, contractors' licenses and vehicle and equipment licenses and insurance. All costs for licenses shall be included in the Contract Amount.

1.6 MANUFACTURER'S SPECIFICATIONS AND INSTRUCTIONS

- A. All manufactured materials, products, processes, equipment, or the like shall be installed or applied in accordance with the manufacturer's instructions, directions, or specifications. Said installation or application shall be in accordance with printed instructions furnished by the manufacturer of the material or equipment concerned. Installation instructions for critical equipment/material shall be furnished to the Owner before work is begun. These instructions shall be included within the submittal for the subject product/material.

1.7 DISCREPANCIES

- A. Drawings and specifications are intended to be complementary to one another. If the Contractor finds any discrepancies between drawings and applicable codes, supporting specifications, or standards, the Contractor shall immediately notify the Owner and Owner's Engineer, in writing, and the Owner shall promptly do the same. Contractor shall be responsible for verification and coordination of dimensions affecting their work.

1.8 WORK, INFORMATION, AND SERVICES BY OWNER AND OTHERS

- A. Work by Others:
 - 1. The following Materials shall be supplied/furnished by the contractor:
 - a. Relay Panels
- B. Owner-Furnished Material
 - 1. The following Materials shall be supplied/furnished by the owner:
 - a. Conduit
 - b. 15kV Circuit Breaker
 - c. Voltage Transformers
 - d. Disconnect Switches
 - e. Tap Wire
 - f. Miscellaneous equipment as shown in Bill of Material (BOM)
 - 2. The Owner will furnish materials as noted on the Bill(s) of Materials which will be picked up at a location identified by the Owner and hauled to the Site by the Contractor.

3. The Owner may furnish additional items to the Contractor for installation. Owner-furnished items will be indicated or specified as such.
4. The Owner will be responsible for providing shop drawings, product data, samples, and manufacturer instructions for all Owner-furnished materials.
5. Bill of materials for all owner supplied materials shall be provided or shall be incorporated within the design package.
6. The Contractor shall load, unload, haul, distribute, and store all Owner-furnished materials, unless otherwise specified.
7. The Contractor shall accept materials at the point of delivery.
 - a. Upon receipt, the Contractor shall inspect all materials to ensure that they are in good condition and that quantities are correct.
 - 1) Any materials which do not meet specifications or are damaged shall be culled by the Contractor. The Contractor shall notify the Owner as to the items culled and reason for culling.
 - b. After inspection, the Contractor shall inventory all items received and accepted. This inventory must include item descriptions, material marks (when applicable), quantities, and other appropriate information.
 - c. The Contractor shall execute a receipt to the Owner for all accepted items.
8. Upon acceptance of materials, the Contractor is solely responsible for their care, storage, and protection. If any Owner-furnished materials are damaged, lost, stolen, or destroyed by any cause, whatsoever, repair or replacement is at the Contractor's expense with no additional cost to the Owner.
9. All materials furnished by the Owner in excess of those utilized for the Work must be returned to the Owner at the Owner's designated location. The Contractor shall submit inventory forms for all returned materials. Packing, loading, and hauling of excess materials is at the Contractor's expense.

1.9 WORK SEQUENCE AND COORDINATION

- A. The Contractor shall perform the Work in in such a manner to meet the Milestone dates as identified by the Owner.

1.10 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Submittal Procedures:
 1. Administrative Submittals
 - a. The Contractor shall submit to the Owner a detailed construction schedule that demonstrates a clear understanding of the work scope and timeframe to complete the work.
 - b. Inventory forms for Owner-furnished materials.

1.11 WORK QUALITY

- A. Work shall be performed by construction workers skilled and experienced in the work involved. All work on this Project shall be performed in accordance with the best practices of the various trades involved and in accordance with the Drawings and these Specifications.

- B. All work shall be erected and installed plumb, level, square, and true, or true to the indicated angle, unless otherwise specified. All finished work shall be free from defects and damage. Quality workmanship is of primary importance on this Project.
- C. Owner reserves the right to reject any materials and work quality which is not considered to be up to the highest standards of the various trades involved. Such inferior material or work quality shall be repaired or replaced as directed, at no additional cost to the Owner.

1.12 CHANGE CONTROL

- A. Changes to this specification shall be made by written addenda. The Owner will not be responsible for any verbal interpretations or instructions with respect to this specification or the equipment described herein. In the event of any discrepancies between the Manufacturer's proposal and this specification, the terms of this specification shall apply unless written exception is provided by the Manufacturer and approved by the Owner. If the Manufacturer finds any omissions or discrepancies in this specification, the Manufacturer shall notify the Owner before starting or continuing with the work.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Information (RFI's).

1.3 COORDINATION

- 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. The manner in which the Specifications are divided into Divisions and Sections is not intended to indicate division of work between trades nor indicate trade union or jurisdictional agreements.
 - 3. Coordinate all work activities with other contractors performing work in these and adjacent areas. The Contractor shall avoid interference and ensure the continued progression of work.

- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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. Material transportation and delivery logistics
 - 6. Progress meetings.
 - 7. Pre-installation conferences.
 - 8. Project closeout activities.

9. Startup and adjustment of systems.
10. Project closeout activities.

1.4 SUPERVISION

- A. Contractor is solely responsible for construction means, methods, techniques, sequences, and procedures for performing all Work.
- B. In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.5 PROJECT MEETINGS

- A. Construction Manager will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
- B. Preconstruction Conference: Construction Manager will schedule a preconstruction conference after Award of Contract and prior to the start of construction.
 1. Items to be discussed, but not limited to:
 - a. Introductions.
 - b. Responsibilities of Contractor's and Owner's Key Project Personnel.
 - c. Project Administration.
 - d. Commercial Submittals.
 - e. Technical Submittals.
 - f. Design Documents Configuration Management Procedures (RFI's, etc.).
 - g. Project Schedule.
 - h. Invoicing
 - i. Additional Work Request and Change Order Procedures.
 - j. Quality Control Program.
 - k. Environmental/Hazardous Waste Concerns.
 - l. Contractor's Site Specific Health and Safety Program.
 - m. Safety Orientation.
 - n. Project Close-out
- C. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.
 1. Review minutes of previous meeting.
 2. Review of weekly safety audit and any reported accidents, injuries & near misses.
 3. Review administrative items.
 4. Review status of construction schedule.
 5. Plan work progress during next work period and its effect on related work of others (two week look-ahead schedule).
 6. Review and note field observations, problems, and decisions.
 7. Identify and resolve all present and outstanding problems.
 8. The Contractor will make physical arrangements for the meetings, prepare an agenda, preside over the meetings, record the minutes of the meetings, and distribute copies to the participants and those affected by the decisions made at the meeting

9. Meetings should be available for teleconference or video conference participation, as appropriate.

1.6 SUBMITTALS

- A. Within fourteen (14) calendar days following project award, submit documents and records for the Owner's review and approval in accordance with Section 01 33 00 – Submittal Procedures.

1.7 REQUEST FOR INFORMATION (RFI'S)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
 1. During Project initiation and approved RFI Form will be established.
- B. Engineer's and Construction Manager's Action: Engineer and Construction Manager will review each RFI, determine action required, and return it within X business days.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 33 00 SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This section provides the format and content of submittals for review and defines the review notations. It also defines the Contractor's responsibility for identifying submittals with a unique numbering system, the need for Contractor review prior to submission, and other administrative tasks. The section also defines the various types of submittals and their content.

1.2 DEFINITIONS

- A. Reviewer: Entity or person authorized to review and accept a submittal.
- B. Submittal Type: Submittal requirements are specified in the technical sections. Submittals are identified by Submittal Type title, and may include some or all of the following:
 - 1. Administrative Submittals: Submittals requested by the Owner that relate primarily to contract administration and/or construction management and do not require review by the Engineer.
 - a. Certificates of insurance
 - b. Surety bonds (if required by Owner)
 - c. List of proposed Subcontractors
 - d. Proposed Project Schedule
 - e. List of proposed products
 - f. Submittal log
 - g. Schedule of prices
 - h. Health and safety plan
 - i. Work plan
 - j. Quality Control(QC) plan
 - k. Environmental protection plan
 - 2. Shop Drawings
 - a. Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
 - b. Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
 - c. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.
 - 3. Product Data
 - a. Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.
 - b. Samples of warranty language when the contract requires extended product warranties.

4. Samples
 - a. Fabricated or unfabricated physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
 - b. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
 - c. Field samples and mock-ups constructed on the project site that establish standards by which the ensuring work can be judged. This includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.
5. Design Data
 - a. Design calculations, mix designs, analyses or other data pertaining to a part of work.
6. Test Reports
 - a. Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.
 - b. Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project before shipment to job site.
 - c. Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
 - d. Investigation reports.
 - e. Daily logs and checklists.
 - f. Final acceptance test and operational test procedure.
 - g. Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.
 - h. Factory test reports
7. Certificates
 - a. Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
 - b. Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.
 - c. Text of posted operating instructions.
8. Manufacturer's Instructions

- a. Preprinted material describing installation of a product, system, or material, including special notices and Safety Data Sheets concerning impedances, hazards, and safety precautions.
9. Operation and Maintenance Data
 - a. Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.
 - b. This data is intended to be incorporated in an operations and maintenance manual or control system.
10. Closeout Submittals
 - a. Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.
 - b. Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.3 SUBMITTALS

- A. Submit the following in accordance with this section:
 1. Administrative Submittals
 - a. Submittal log

1.4 PREPARATION

- A. Submittals must be identified on the transmittal by type, as follows:
 1. Administrative
 2. Shop Drawings
 3. Product Data
 4. Samples
 5. Design Data
 6. Test Reports
 7. Certificates
 8. Manufacturer's Instructions
 9. Operation and Maintenance Data
 10. Closeout Submittals
 11. Other (specify)
- B. Provide all submittals in electronic format (e.g. PDF, Microsoft Word, Microsoft Excel, AutoCAD, etc.).
- C. An Owner-accepted transmittal form must accompany all submittals. AIA Document G810 or ones having similar information are acceptable for use. Transmittals must be sequentially numbered.

- D. Contractor must prepare and maintain a submittal log listing items for which submittals are required by the specifications. The submittal log shall include the following information:
 - 1. Project name, number, and location
 - 2. Transmittal number
 - 3. Specification section in which submittal is required
 - 4. Submittal type
 - 5. Brief description of submittal
 - 6. Date of transmittal
 - 7. Date of which Owner/Engineer review is returned
 - 8. Disposition of submittal
- E. Contractor must follow the agreed-upon procedure for the project to transfer submittal documents to pertinent parties for review.
- F. The Contractor must perform a quality control review of submittals prior to transmittal to the Owner and/or Engineer. Apply a stamp to the documents indicating that a review was completed by the Contractor and include the name(s) of the reviewer(s).
- G. The Contractor must schedule submittals sufficiently in advance of the work with consideration for possible resubmittals. Allow for a period of 10 business days for each review.

1.5 SUBSTITUTIONS

- A. Substitutions which deviate from the Contract Documents require Owner approval and will be considered where advantageous to the Owner.
- B. Considering Substitutions
 - 1. Discussion of substitutions with the Owner and Engineer before submission of a substitution submittal will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For substitutions that include design changes or some material or product substitutions, the Owner will require an evaluation and analysis by the Engineer. The Owner reserves the right to offset the costs of evaluation and analysis from payments otherwise due the Contractor.
- C. Proposing Substitutions
 - 1. When proposing a substitution, transmit a submittal, clearly marked as a "SUBSTITUTION" to the Owner, with documentation illustrating the nature and features of the substitution including any necessary technical submittals and why the substitution is desirable and beneficial to the Owner. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for substitution, include the submittals required for the item. Clearly mark the proposed substitution in all documentation.
 - 2. Specifically point out substitutions from the Contract Documents in a transmittal letter or substitution submittal. Failure to point out substitutions may cause the Owner to require rejection and removal of such work at no additional cost to the Owner.

3. The Owner will indicate an approval or disapproval of the substitution request; and if not approved as submitted, will indicate the Owner's reasons therefore. Any work done before such approval is received is performed at the Contractor's risk.

D. Warranting that Substitutions are Compatible

1. When delivering a substitution for approval, the Contractor warrants that this contract has been reviewed to establish that the substitution, if incorporated, will be compatible with other elements of work.

E. Review Schedule Extension

1. In addition to the normal submittal review period, a period of 10 business days will be allowed for the Owner to consider submittals with substitutions.

1.6 SCHEDULING

- A. Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

1. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.
2. Submittals called for by the contract documents shall be listed on the log. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the log and annotate it "N/A" with a brief explanation. Approval by the Owner does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the log or marked "N/A."
3. Re-submit log and annotate monthly by the Contractor with actual submission and approval dates. When all items on the log have been fully approved, no further re-submittal is required.
4. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved submittal log.

1.7 REVIEW

- A. When reviewing submittals, the Reviewer will:

1. Note date on which the submittal was received.
2. Review submittals within scheduling period specified and only for conformance with project design concepts and compliance with contract documents

3. Identify returned submittals with one of the actions defined in the article entitled “Review Notations” of this section and with markings appropriate for action indicated.

B. Review Notations

1. Submittals marked “Reviewed with No Exceptions” indicate that the submittal is accepted, and the work may proceed for the item.
2. Submittals marked “Reviewed with Exceptions Noted” indicate that the submittal is accepted provided that the Contractor agrees with and incorporates the corrections prior to proceeding with the work for the item. No resubmittal is necessary.
3. Submittals marked “Revise & Resubmit” indicate an incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for the item until the resubmittal is accepted.
4. Submittals marked "Rejected" indicate that the submittal is noncompliant, does not have evidence of being reviewed and approved by the Contractor, or is incomplete. A submittal marked "Rejected" will not be reviewed and will be returned with an explanation of the reason for rejection. Resubmit with appropriate changes. Do not proceed with work for the item until the resubmittal is accepted.

1.8 UNACCEPTED OR REJECTED SUBMITTALS

- A. The Contractor must make corrections required by the Reviewer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give notice to the Owner. The Contractor is responsible for the construction of work. Failure to point out substitutions may result in the Owner requiring rejection and removal of such work at the Contractor's expense.
- B. In the event that a comment by the Reviewer compromises the integrity of the work, notify the Owner in writing, and a mutually-agreeable solution will be developed.
- C. If changes are necessary to submittals, make such revisions and resubmit in accordance with the procedures above. Identify changes made since previous submission via use of clouds or other clearly visible notation. No item of work requiring a submittal change is to be accomplished until the changed submittals are accepted.
- D. The Contractor must reimburse the Owner for any submittals that are re-submitted more than once (i.e. initial submittal and revision one). The Owner reserves the right to offset the cost of excess submittal reviews from payments otherwise due the Contractor.

1.9 ACCEPTED SUBMITTALS

- A. The acceptance of submittals is not to be construed as a complete check, and indicates only that the design, general method of construction, materials, detailing, and other information are satisfactory.

- B. The acceptance of submittals does not relieve the Contractor of the responsibility for any error or omission which may exist because the Contractor is responsible for ensuring information contained within each submittal accurately conforms to the requirements of the Contract Documents.
- C. The review of submittals is only for general conformance with the project requirements indicated in the Contract Documents and for consistency with project design concept. This review does not relieve the Contractor from responsibility for errors or omissions in designs for which the Contractor is responsible, for compliance with requirements of the Contract Documents, and for the safe and successful construction of the work. This review does not consider the means, methods, techniques, sequences or operations of construction, or safety, precautions or programs incidental thereto, which are the sole responsibility of the Contractor.
- D. After submittals have been reviewed and accepted, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 40 00 QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. The work covered under this specification section includes requirements for the Contractor's quality control, qualifications, reports, and tests and inspections. The Contractor shall perform all work in accordance with the approved Quality Control Plan.
- B. Contractor and its independent testing agency shall furnish supervision, labor, tools, material, equipment, and laboratory facilities necessary for, or incidental to, the sampling, inspection, and testing services required by the Work.
- C. The Owner and his representatives shall be provided with full access to Contractor, subcontractor, and supplier facilities for the purpose of implementing the Owner's quality assurance procedures. This may include verifying compliance with the Contractor's quality control requirements, performing quality audits, and witnessing inspections and tests. Such access will be during normal business hours unless the test or inspection has been scheduled during off hours.
- D. If unacceptable testing or inspection practices are observed, the Contractor will be notified that corrective action is required. If such unacceptable practices continue, the Owner reserves the right to stop work until all unacceptable practices have been addressed and corrected. This may include actions up to and including replacing any testing service personnel or retaining a new testing firm. Any additional costs incurred to resolve corrective actions shall be the sole responsibility of the Contractor.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Submittal Procedures:
 - 1. Administrative Submittals
 - a. Resume for Contractor's project manager (within 14 calendar days of award).
 - b. Qualifications for subcontractors (within 14 calendar days of award), including:
 - 1) Resumes of key personnel
 - 2) A list of completed projects of similar work. Include the location, name of project, Owner, general contractor, and a summary of work performed.
 - c. Contractor quality control plan (within 21 calendar days of award).
 - d. Qualifications of independent testing firm(s) (within 21 calendar days of award), including:
 - 1) Accreditation certificates
 - 2) Resumes of key personnel
 - 3) A list of at least ten projects of similar scope and equipment completed within the last five years. Include the location, name of project, Owner, and a summary of services performed.
 - 2. Samples

- a. Submit test report formats for approval by the Owner for each independent test type to be performed.

1.3 QUALIFICATIONS

- A. Independent Testing and Inspection Firm Qualifications Criteria
 1. Intendent testing and inspection firms, including laboratories, are subject to approval by the Owner.
 2. The firm must have successfully completed a testing or inspection program for at least ten projects of similar scope and equipment within the last five years.
 3. The firm shall be authorized to operate within the state where the Project Site is located.
 4. The firm shall maintain a full-time, licensed Professional Engineer on staff to supervise services.
 5. The firm's personnel shall be trained and experienced in the necessary skills, be familiar with the standards specified for inspection and testing, and be familiar with local conditions. Training must be documented.
 6. Testing equipment shall be calibrated at reasonable intervals with devices of accuracy traceable either to the National Institute of Standards and Technology (NIST) or to accepted values of natural physical constants. Calibration documentation shall be submitted upon request by the Owner.
 7. Construction Materials Testing Laboratories
 - a. All construction materials testing laboratories must be accredited by an acceptable authority. Acceptable accreditation authorities include:
 - 1) National Voluntary Laboratory Accreditation Program (NVLAP);
 - 2) American Association of State Highway and Transportation Officials (AASHTO); and
 - 3) American Association of Laboratory Accreditation (A2LA).
 - b. Other accreditation authorities may be considered on a case-by-case basis.
 - c. The laboratory may only perform tests for which it is accredited. The accreditation certification must cite the specific standards for which it applies.

1.4 CONTRACTOR QUALITY CONTROL

- A. Field Quality Control
 1. The Contractor shall monitor quality control of its subcontractors, suppliers, manufacturers, material, equipment, products, services, site conditions, and workmanship to produce Work of specified quality.
 2. Perform work using persons qualified to produce workmanship of the specified quality.
 3. Only use materials, equipment, and products which comply with the Contract Documents.
 4. Comply with specified standards as the minimum quality for the Work. Where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship, such requirements shall be implemented. When quality standards are not specified, comply with standards normal to the trade, or request guidance from the Owner.
 5. Verify that field measurements are as indicated.

6. Comply with manufacturer's installation instructions, including each step in the sequence.
7. Tools and equipment designed to utilize manufacturer-specific components shall only use those components.
8. If manufacturer's instructions conflict with the Contract Documents, notify the Owner and Engineer in writing, and request clarification from the Engineer before proceeding.
9. Conduct field quality control inspections and testing.
10. The Owner and Engineer may inspect any portion of the Work at any reasonable time and may witness testing of any portion of material and equipment wherever located.
 - a. The Owner and Engineer shall be notified at least 3 days in advance of inspections, tests, and witness points to allow adequate time for scheduling of personnel for observation.
 - b. The Authority Having Jurisdiction shall be notified at least 3 days in advance of any required inspections to allow adequate time for scheduling of personnel.

1.5 INDEPENDENT TESTING AND INSPECTION

- A. The Contractor shall employ and pay for the services of an independent, Owner-approved firm (or firms) to perform specified inspections and testing.
- B. Inspections, testing, and source quality control may occur on or off the Project Site.
- C. Cooperate with the independent firm. Furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance as requested.
 1. Notify the independent firm sufficiently in advance of expected time for operations requiring services.
 2. Make arrangements with independent firm and pay for additional samples and tests required for the Contractor's use.
- D. Retesting or re-inspections required because of non-conformance to specified requirements shall be performed by the same independent firm if directed by the Owner. Payment for retesting or re-inspecting shall be at no additional cost to the Owner.
- E. Costs incurred by the Owner associated with retesting or re-inspections required because of non-conformance to specified requirements may be offset against amounts due to the Contractor at the Owner's sole discretion.
- F. Testing or inspecting does not relieve the Contractor of the obligation to perform the Work in accordance with the requirements of the Contract Documents.
- G. The Owner and his representatives reserve the right to inspect the operations of the independent firm at any time.
- H. Limitations on Independent Testing and Inspection Firm(s)
 1. Firm may not release, revoke, alter, or expand on the requirements of the Contract Documents.
 2. Firm may not approve or accept any portion of the Work.

3. Firm may not assume duties of the Contractor.
4. Firm has no authority to stop the Work.

1.6 REPORTS

- A. Prepare a report to document each test and inspection performed. Submit the report to the Owner and the Engineer within 14 calendar days of completion of the test or inspection, or prior to any subsequent activities that are dependent on satisfactory test results.
- B. Reports shall, at a minimum, include the following:
 1. Date of report issue
 2. Project name and number (if applicable)
 3. Name of testing or inspecting personnel
 4. Date and time of sampling, testing, or inspection
 5. Identification and location at the Site of item tested or inspected
 6. Identification of applicable requirements and specification section(s)
 7. Type of test or inspection
 8. Observations and results of test or inspection
 9. Statement of conformance or non-conformance with the Contract Documents
- C. Additional interpretation of results shall be provided when requested by the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PREPARATION AND EXAMINATION

- A. The Contractor shall perform the following tasks prior to beginning work on each definable feature of work:
 1. Review each paragraph of the applicable specification sections.
 2. Review the Drawings.
 3. Verify that field measurements are as indicated on construction and/or shop drawings.
 4. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.
 5. Review the quality control plan and ensure that provisions have been made to provide the required quality control testing and inspection.
 6. Examine the work area to ensure that the required preliminary work has been completed and complies with the Contract Documents.
 7. Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
 8. Verify that materials, products, and equipment received comply with the Contract Documents.

9. Examine the required materials and equipment to ensure that they are on hand, that they conform to the approved shop drawings and submitted data, that they are in good, serviceable condition, and that they are properly stored.
10. Discuss specific controls used and construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each definable feature of work.

3.2 INITIAL QUALITY CONTROL ACTIVITIES

- A. The Contractor shall perform the following tasks for each definable feature of work:
 1. Ensure that personnel are qualified to perform the functions assigned.
 2. Establish level of workmanship and verify that it meets the minimum acceptable workmanship standards. Compare with required samples as appropriate.
 3. Review with assigned personnel work requirements, sequence, special tools, and procedures.
 4. Check work to ensure that it is in full compliance with contract requirements.
 5. Resolve any workmanship issues.
 6. Resolve all differences.
 7. Ensure that inspections and tests have been scheduled and that all parties are notified sufficiently in advance.
 8. Ensure that testing and inspection is performed by the approved firm(s).
 9. Review project specific work plans (i.e. HAZMAT Abatement, Stormwater Management) to ensure all preparatory work items have been completed and documented.

3.3 FOLLOW-UP QUALITY CONTROL ACTIVITIES

- A. The Contractor shall perform the following for on-going work daily, or more frequently as necessary, until the completion of each definable feature of work.
 1. Ensure the work is in compliance with Contract requirements.
 2. Maintain the quality of workmanship required.
 3. Ensure that testing and inspection is performed by the approved firm(s).
 4. Verify that required inspection and testing are in compliance with the contract.
 5. Ensure that non-conforming items are being corrected.
 6. Assure manufacturer's representatives have performed necessary tests and inspections, if required.
 7. Verify physical dimensions, locations, and elevations of constructed features as work progresses.
 8. Ensure that completed systems meet specified requirements, operate as intended, and have been properly documented.
- B. Conduct additional preparatory and initial phases on the same definable feature of work if the quality of on-going work is unacceptable, if there are changes in the applicable quality control organization, if there are changes in the on-site production supervision or work crew,

if work on a definable feature of work is resumed after substantial period of inactivity, or if other problems develop.

END OF SECTION

SECTION 01 42 16 DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Wherever any of the words or phrases defined herein, or a pronoun used in place thereof, is used in any part of the Contract Documents, it shall have the meaning here set forth. In the Contract Documents, the neuter gender includes the feminine and masculine, and the singular number includes the plural.

1.2 DEFINITIONS

- A. While an effort was made to identify all defined terms with initial caps, the definitions following definitions shall apply regardless of case unless context otherwise requires:
 1. Authority Having Jurisdiction: An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.
 2. Contract Documents: The Contract Documents shall consist of the documents identified as the Contract Documents in the Contract, plus all changes, addenda, and modifications thereto.
 3. Contractor: The person or entity identified as such in the Contract and referred to throughout the Contract Documents as if singular in number and neutral in gender. The term "Contractor" means the Contractor or its authorized representative.
 4. Drawings: The graphical and pictorial portions of the Contract Documents wherever located and whenever issued, showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
 5. Engineer: A person who holds a valid professional engineer's license in the state where the Work is located and who is responsible as the engineer-of-record for the design of the Work.
 6. Owner: Ipswich Electric. When used in the Contract Documents, this includes employees and designated representatives of the Owner.
 7. Site: The particular geographical location of Work performed pursuant to the Contract Documents.
 8. Specifications: The written portion of the Contract Documents consisting of requirements for materials, equipment, construction systems, standards, and workmanship for the Work; performance of related services.
 9. Work: The entire completed construction, or the various separately identifiable parts thereof, required to be furnished under the Contract Documents within the Contract Time. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents including everything shown in the Drawings and set forth in the Specifications. Wherever the word "work" is used, rather than the word "Work", it shall be understood to have its ordinary and customary meaning.

- B. The following terms are not necessarily identified with initial caps; however, they shall have the meaning set forth below:
1. By Others: Work that is outside the scope of Work to be performed by the Contractor under this Contract, which will be performed by the Owner, other contractors, or other means.
 2. Furnish: Supply only, do not install.
 3. Indicated: Shown or noted on the Drawings.
 4. Provide: Furnish and install.
 5. Specified: As written in the Specifications.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. This section defines requirements for temporary office and storage trailers, temporary utility services, snow removal, site maintenance, sanitary facilities, site clean-up and restoration.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Submittal Procedures:
 - 1. Administrative Submittals
 - a. Prior to mobilization, the Contractor shall develop and submit a proposed site layout of the Contractor's anticipated temporary facilities and controls. The layout shall include a scaled drawing of the site depicting the number and location of office and storage trailers, material storage locations, containment areas (when applicable), shipping staging, and construction equipment parking areas. The site drawing shall clearly identify travel lanes through the yard. Travel lanes of not less than 12 feet clear shall be maintained through the yard. Site layout shall consider work sequence, safety clearances, soil material handling, soil material stockpile locations, and other Contractor operations.
 - b. The Contractor's temporary office, material storage, construction equipment parking, operation of construction plants, and similar use of land shall be confined to the areas designated by the Owner or otherwise approved in writing.
 - c. The proposed site layout shall be submitted within twenty-one calendar days following project award. The layout plan shall be subject to approval by the Owner.

1.3 UTILITY PRECAUTIONARY REQUIREMENTS

- A. As this is an operating and energized facility, Owner access to site must be maintained throughout the construction of the project.
- B. The Contractor will be working over, under, and adjacent to active utility lines. Utility lines may include electric (high, medium, and low voltage), high pressure gas lines, fuel lines, water and sewer pipelines, telephone, and fiber optic lines. Appropriate precautions shall be exercised including, but not limited to:
 - 1. Limiting vehicle travel over the utility lines to the minimum number of crossings necessary.
 - 2. Electro-mechanical relays can be sensitive to vibration and other disturbances. Limit operation of reciprocating tools or vibratory compactors in the vicinity of energized electro-mechanical control devices. Care shall be exercised so as not to bump or otherwise disturb systems to remain in operation.
 - 3. Contractor shall take appropriate measures to prevent dust migration within an active control house. Provide dust barriers, positive pressure enclosures, HEPA blowers, fans,

and vacuum systems to limit or prevent dust from entering existing control cabinets and equipment enclosures.

4. Existing utilities shall be located by hand excavation prior to mechanized (excavator) operation.

1.4 PERMITS

- A. Except as specifically identified, the Contractor shall obtain all permits required for the prosecution of the work including, but not limited to:
 1. Handling and disposal of hazardous materials.
 2. Hauling and disposal of excess soil and excavated materials.
 3. Hauling and disposal of contaminated soil and water, if any.
 4. Water discharge.
 5. Job trailer siting and connection.
 6. Roadway openings.
 7. Hot work/burning permits.
- B. The Contractor shall ensure the appropriate utility locating service (i.e. Dig-Safe) for the project vicinity has been notified and clearance certificates for underground utilities have been obtained prior to the start of construction.

1.5 TEMPORARY ELECTRICITY

- A. The Contractor will provide a reasonable capacity power service as needed for construction operation. The Contractor shall extend the power service to a convenient point in the yard.
- B. Provide temporary electric feeder from the Owner-provided service connection point to the Contractor-provided temporary buildings, trailers and work sites.
- C. Do not disrupt the Owner's use of service. Temporary wiring shall be per NFPA 241 and NFPA 70, Article 590-6 (B)(2), "Assured Equipment Grounding Conductor Program." Provide frequent inspection of temporary electric service cable and equipment.
- D. The Contractor shall identify power needs and coordinate construction site power requirements with the Owner.
- E. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.
- F. Permanent convenience receptacles may be utilized during construction provided it does not disrupt the Owner's ongoing substation operations.

1.6 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required portable facilities and enclosures. Existing facility use, if any, is not permitted. Provide facilities at time of project mobilization. A minimum of two portable toilets shall be provided for the duration of the project.
 - 1. The Contractor shall provide and maintain in sanitary condition, facilities adequate for the needs of the Contractor's personnel, Subcontractors, and the Owner's on-site representatives.
- B. Sanitary facilities shall comply with applicable building and sanitation ordinances, laws, and codes.

1.7 REFUSE DISPOSAL

- A. Provide dumpsters of sufficient size and quantity to receive debris from the construction operations. Separate dumpsters shall be provided for general refuse, equipped with cover and doors, to prevent windblown debris and access by scavenger animals. Additional dumpsters or receptacles shall be provided for each type of recyclable material in accordance with the disposal site's separation requirements. Receptacles shall be conspicuously marked to indicate intended use.
- B. A concrete pad or other appropriate support system shall be provided to limit damage to the substation yard due to dumpster loading and unloading operation.

1.8 FIRE EQUIPMENT

- A. Each office trailer shall be equipped with a minimum of two (2) 20 lb, A-B-C fire extinguishers. Sufficient quantities of additional firefighting equipment suitable for use around electrical equipment shall be provided and maintained on site.

1.9 PARKING

- A. Personal Vehicles
 - 1. The Contractor shall arrange for Contractor personnel vehicle parking in Owner-designated on-site parking areas.
- B. Emergency Ingress/Egress
 - 1. Travel lanes along the substation access road and within the substation shall be maintained for emergency vehicle ingress/egress and material deliveries.

1.10 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, manholes, duct banks, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. The Contractor shall cleanup and haul all trash and construction debris to dumpsters provided by the Contractor. The Contractor shall perform continual, daily cleanup of all work areas and those of the Subcontractors. Trash shall not be allowed to accumulate. The Contractor and Subcontractors shall deposit trash completely within the dumpsters provided. Any hazardous or abnormal waste generated shall be handled and properly disposed of offsite.
- E. Portable toilet facilities shall be serviced not less than bi-weekly, and more frequently during summer months.

1.11 SNOW REMOVAL

- A. The Contractor shall provide snow removal within the immediate work area, work site access roads, and walkways. Immediate work area includes all storage sites, temporary offices, parking and any area disturbed by on-going construction operations. Roads, walkways, stairs, and parking areas shall be kept free of snow and ice at all times. Provide sanding and salt as required to eliminate slippery conditions. Snow removal shall be provided by the Contractor for the duration of the project, including testing and commissioning activities.

1.12 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials prior to Final Inspection.
- B. Remove above grade installations as directed. Grade site as indicated on Drawings and/or restore to original condition.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition or to match existing, as applicable.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 77 00 CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following: references
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
 - 4. Closeout documentation.

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

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 12. Complete final site restoration, cleaning requirements, including touchup painting.

1.3 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit Punchlist
 - 2. Submit final completion photographic documentation
- B. The Contractor shall obtain written approval from the Owner that all work is done in accordance with the Contract Documents, including all specifications and drawings, before final demobilization.

1.4 LIST OF INCOMPLETE ITEMS (PUNCHLIST)

- 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. Include the following information at the top of each page:
 - a. Project Name
 - b. Date
 - c. Name of Contractor
 - d. Page Number
 - 2. Submit list of incomplete items in MS Excel, PDF electronic file, or other format acceptable to Owner.

1.5 SUBMITTAL OF PROJECT WARRANTIES

- A. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- B. Provide additional copies of each executed warranty to include in operation and maintenance manuals.
- C. Warranty Electronic File: Provide executed warranties and bonds in PDF format. Assemble complete executed warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 78 00 CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Project Record Documents
 - 2. Project Record Specifications
 - 3. Submission of Warranties
 - 4. Operation and Maintenance Manuals.
 - 5. Spare parts and overages
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in the Technical Specifications and the Supplementary and General Conditions.

1.2 SUBMITTALS

- A. At completion of project, deliver record documents to Engineer. The Contractor shall provide two (2) complete sets of these “As-Built” drawings, fully marked- up, within one (1) week after Acceptance of the Work. If Shop Drawings are prepared by computer (AutoCAD or MicroStation), one complete electronic set of all Shop Drawings will be submitted.
- B. Accompany submittal with transmittal letter to Owner, in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Title and number of each record document.
 - 5. Certification that each document as submitted is complete and accurate.
 - 6. Signature of Contractor, or their authorized representative.
- C. A copy of all correspondence between the Contractor and the Engineer shall be provided to the Owner.
- D. On or about final completion, transmit to the Owner required guarantees, affidavits, releases, bonds and invoices. Turn over all keys, manuals, record drawings and maintenance manuals.

1.3 PROJECT DOCUMENT CONTROL

- A. The Contractor shall maintain at the job site on current basis, one copy of:
 - 1. Contract Drawings
 - 2. Project Record Reports
 - 3. Specifications
 - 4. Addenda
 - 5. Shop Drawings

6. Applicable Handbooks
 7. Maintenance and Operating Manuals
 8. Issued Permits
 9. Change Orders
 10. Other Modifications to Contract
 11. Field Request for Engineering Change
 12. Engineering Change Notice
 13. Project Schedules
 14. Contractor's daily progress or inspection reports
 15. Construction photographs
 16. Other documentation as required by agencies having jurisdiction
- B. Documents shall be stored in a dry, safe place apart from documents used for construction purposes.
- C. Record documents shall not be used for construction purposes.
- D. Documents shall be available at all times for inspection by Engineer, Owner, and authorized representatives of Federal or State agencies.

1.4 AS BUILT RECORDS

- A. Contractor shall keep records of its work as installed: including any changes or adjustments made from the Contract Documents. Contractor shall transcribe all such records on to a neat, clean, well drafted, final record drawing set at the completion of the work. The as-built drawings shall be reviewed by the Owner for completeness before acceptance. Receipt and acceptance of these record drawings shall be a condition for final payment. In the event the Contractor fails to record the changes, the Owner may at its discretion employ a firm to record visible field changes and deduct the fee from the Contractor.

1.5 RECORD SPECIFICATIONS

- A. Specifications: Legibly mark and record at each product Section description of the actual products installed, including the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Directory, listing the names, addresses, and telephone numbers of the Design Agent, its Consultants, Contractor, Subcontractors, and major equipment suppliers.
- B. Operation and maintenance instructions, arranged by system and subdivided by the specification Section. For each category, identify the names, addresses, and telephone numbers of the Subcontractors and suppliers. Identify the following:

1. Significant design criteria
2. List of equipment
3. Parts list for each component.
4. Operating instructions.
5. Maintenance instructions for equipment and systems.
6. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

C. Project documents and certificates, including the following:

1. Shop drawings and product data.
2. Certificates.
3. Originals of warranties and bonds.

1.7 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in the quantities specified in the individual specification Sections.
- B. Deliver to the Project site and place in a location as directed by the Owner; obtain a receipt prior to final payment.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. The Work covered under this specification section includes materials, formwork, proportioning, placing, and testing for cast-in-place concrete.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. The reference shall be taken as the latest version of the publication in effect on the date of issuance of this Specification, except where a specific date is established by code or is stated in this Specification.
- C. American Concrete Institute (ACI)
1. ACI 117 - Specification for Tolerances of Concrete Construction and Materials
 2. ACI 121R - Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
 3. ACI 301 - Specifications for Structural Concrete
 4. ACI 302.1R - Guide to Concrete Floor and Slab Construction
 5. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete
 6. ACI 305.1 - Specification for Hot Weather Concreting
 7. ACI 306.1 - Standard Specification for Cold Weather Concreting
 8. ACI 308.1 - Specification for Curing Concrete
 9. ACI 318 - Building Code Requirements for Structural Concrete
 10. ACI 347R - Guide to Formwork for Concrete
 11. ACI SP-2 - Manual of Concrete Inspection
- D. ASTM International (ASTM)
1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 2. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
 3. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 4. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
 5. ASTM C33 - Standard Specification for Concrete Aggregates
 6. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 7. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 8. ASTM C94 - Standard Specification for Ready-Mixed Concrete

9. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
10. ASTM C150 - Standard Specification for Portland Cement
11. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete
12. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
13. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
14. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete
15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
16. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
17. ASTM D471 - Standard Test Method for Rubber Property—Effect of Liquids
18. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete
19. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
20. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
21. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
22. ASTM C920 - Standard Specification for Elastomeric Joint Sealants
23. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars
24. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
25. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
26. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
27. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
28. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
29. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
30. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
31. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

E. Concrete Reinforcing Steel Institute (CRSI)

1. CRSI MSP - Manual of Standard Practice
2. CRSI RB4.1 - Supports for Reinforcement Used in Concrete

F. National Institute of Standards and Technology (NIST)

1. NIST PS 1 - Voluntary Product Standard Structural Plywood

G. US Army Corps of Engineers (COE)

1. COE CRD-C572 - Corps of Engineers Specifications for Polyvinylchloride Waterstops
2. COE CRD-C513 - Corps of Engineers Specifications for Rubber Waterstops

1.3 DEFINITIONS

- A. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.
- B. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.
- C. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Submittal Procedures:
 1. Administrative Submittals
 - a. Quality control plan
 - b. Cold weather concrete plan
 - c. Hot weather concrete plan
 2. Shop Drawings
 - a. Reinforcing steel
 3. Product Data
 - a. Cementitious materials
 - b. Admixtures
 - c. Mechanical reinforcing bar connectors
 - d. Waterstops
 4. Design Data
 - a. Concrete mix design(s)
 - b. Construction joint location plan and details
 5. Test Reports
 - a. Aggregates
 - b. Reinforcement mill reports
 - c. Slump
 - d. Temperature
 - e. Compressive strength
 - f. Air content
 6. Certificates
 - a. Testing agency
 - b. Testing laboratory

1.5 MODIFICATION OF REFERENCES

- A. Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Engineer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Follow ACI 301, ACI 304R, and ASTM A934 requirements and recommendations. Do not deliver concrete until forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.
 - 1. Reinforcement
 - a. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.7 QUALITY ASSURANCE

- A. Quality Control Plan
 - 1. Develop a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing.
- B. Qualifications for Field Testing Technician and Testing Agency
 - 1. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.
 - 2. Testing agencies that perform testing services on reinforcing steel must meet the requirements of ASTM E329.
 - 3. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.
- C. Qualifications for Concrete Testing Laboratory
 - 1. All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.
 - 2. The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

3. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and ASTM C1260. The accreditation must be current and must include the required test methods, as specified.
4. Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a licensed professional engineer who is competent in concrete materials and must sign all reports and designs.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

- A. Provide wood, plywood, or steel forms. Use plywood or steel forms where a smooth form finish is required. Round fiber forms are also permitted.
- B. Design formwork and shoring to support loads transmitted to them and to comply with applicable building code requirements.
- C. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.
- D. Wood Forms
 1. Lumber for wood forms shall be free of raised grain, knotholes, or other surface defects.
 2. Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.
- E. Steel Forms
 1. Provide steel form surfaces that do not contain irregularities, dents, or sags.
- F. Round Fiber Forms
 1. Forms shall be constructed of multiple layers of paperboard, spirally wound, and laminated with adhesive. Interior shall be coated with a release agent. Exterior and interior shall be coated with moisture-resistant barrier.
 2. Splicing of fiber forms above finished grade is not permitted.

2.2 FORMWORK ACCESSORIES

- A. Form Ties
 1. Use form ties with ends or end fasteners that can be removed without damage to concrete.
 2. The use of wire ties is prohibited.
 3. Provide form ties and accessories that do not reduce the effective cover of the reinforcement.
- B. Form Release Agent
 1. Use a product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 2. Use a product that reduces formwork moisture absorption and prevents form corrosion.

- C. Chamfer Materials
 - 1. Use lumber materials with dimensions as indicated on the Drawings.

2.3 CONCRETE MATERIALS

- A. Portland Cement
 - 1. Unless otherwise specified, provide ASTM C150 Type I or II cement. Type V cement shall be used if the Drawings call for sulfate-resistant concrete.
 - 2. Type III cement may be proposed as an alternate for use in select situations where high early strength is required. Contractor shall submit a plan identifying where this cement will be used and controls for curing. Due increased likelihood of cracking, Type III cement may not be used for flatwork.
 - 3. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.
- B. Fly Ash
 - 1. Fly ash shall conform to ASTM C618, Class F. Allowable loss on ignition must not exceed 6 percent.
- C. Ground Granulated Blast Furnace (GGBF) Slag
 - 1. Slag cement shall conform to ASTM C989, Grade 100 or 120.
 - 2. Since early compressive strengths may be decreased with the use of slag, the Contractor shall plan for this potential impact on schedule when considering the use of slag-containing mixes.
- D. Silica Fume
 - 1. Use of silica fume is prohibited.
- E. Water
 - 1. Mixing water shall conform to ASTM C1602.
 - 2. Mixing water, including that portion of mixing water contributed in the form of free moisture on aggregates, shall be free of injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.
- F. Aggregates
 - 1. Aggregates shall conform to ASTM C33.
 - 2. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test record or used in trial mixtures.
 - 3. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.
 - 4. Aggregates must not contain any substance which may be deleteriously reactive with the alkalis in the cement.
- G. Admixtures
 - 1. Water reducing, set accelerating, and set retarding admixtures shall conform to ASTM C494.

2. High range water reducing admixtures (i.e. superplasticizers) shall conform to ASTM C1017.
3. Air entraining admixtures shall conform to ASTM C260.
4. Do not use calcium chloride-containing admixtures.
5. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.

2.4 CONCRETE MIX DESIGN

- A. All concrete mix designs used in the work shall comply with the requirements of ACI 318, ACI 301, and the requirements stated herein.
- B. Concrete shall meet the following requirements based on the element type:

Element	Exposure Classes	Maximum Water-Cement Ratio (by weight)	Min. 28-Day Compr. Strength (f _c , psi)	Air Content (percent)
Foundations and Exterior Slabs/Mats	F2/S0/W0/C1	0.45	4,500	Note 1
Interior Floor Slabs	F0/S0/W0/C0	0.55	3,500	≤ 3%
Fence Posts and Bollards	N/A	N/A	2,500	N/A
Duct Banks ² (Non-thermal)	N/A	N/A	2,500	N/A

1. Note 1: Air content shall comply with ACI 318 requirements based on maximum aggregate size. Air entraining admixture shall be used.
 2. Note 2: Duct bank concrete only applies to installations where thermal resistivity properties are not specified.
- C. Nominal maximum aggregate size of coarse aggregate shall not exceed the least of one-fifth the narrowest dimension between sides of forms; one-third the depth of slabs; and three-fourths the minimum specified clear spacing reinforcing.
 - D. Slump requirements will be determined by the Contractor.

- E. Concrete mix proportions shall be established according to section 4.2.3 of ACI 301. If used, strength test records shall not be more than 24 months old.
- F. The concrete materials used to develop the concrete mixture proportions shall correspond to those to be used in the work.

2.5 READY-MIX CONCRETE

- A. Provide concrete that meets the requirements of ASTM C94/C94M.
- B. Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:
 - 1. Type and brand of cement.
 - 2. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete.
 - 3. Maximum size of aggregate.
 - 4. Amount and brand name of admixtures.
 - 5. Total water content expressed by water/cement ratio.

2.6 REINFORCEMENT

- A. Reinforcing Bars
 - 1. Deformed bars shall conform to ASTM A615, Grade 60, billet-steel bars.
 - 2. Plain bars for spiral reinforcement shall conform to ASTM A615, Grade 60.
 - 3. Welding of reinforcing bars is not permitted.
- B. Welded Wire Reinforcement
 - 1. Welded wire reinforcement shall conform to ASTM A1064.
- C. Reinforcing Bar Supports
 - 1. Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire in place.
 - 2. Legs of supports in contact with formwork must be hot-dip galvanized or plastic coated after fabrication; or stainless-steel bar supports must be used.
- D. Tie Wire
 - 1. Wire must be black, soft iron wire, not less than 16 gage.

2.7 MISCELLANEOUS MATERIALS

- A. Waterstops
 - 1. Polyvinylchloride (PVC) waterstops shall conform to COE CRD-C 572.
 - 2. Rubber waterstops shall conform to COE CRD-C 513.
 - 3. Thermoplastic elastomeric rubber (TPER) waterstops shall conform to ASTM D471.
 - 4. Hydrophilic (or swellable) type waterstops be of polymer modified chloroprene rubber shall meet the following requirements when tested per ASTM D412: Minimum tensile strength of 420 psi; and minimum ultimate elongation: 600%. Minimum hardness shall

be 50 on the type A durometer. Minimum volumetric expansion ratio shall be 3 to 1 in distilled water at 70 degrees F.

- B. Expansion/Isolation Joint Filler
 - 1. Preformed joint fillers shall comply with ASTM D1751 or ASTM D1752. Material must be 1/2 inch thick, unless otherwise indicated.
- C. Vapor Retarder and Vapor Barrier
 - 1. Use ASTM E1745 polyethylene sheeting, minimum 10 mil thickness.
- D. Rigid Insulation
 - 1. Insulation for ground-contact use shall be rigid extruded polystyrene (XPS) conforming to ASTM C578. For installations subject to traffic, use Type V (100 psi) insulation. For all other installations use Type VII (60 psi) insulation.
- E. Concrete Curing Materials
 - 1. Provide concrete curing material in accordance with ACI 301 and ACI 308.1.
 - a. Liquid Membrane-Forming Compounds: Comply with ASTM C309.
- F. Non-shrink Grout
 - 1. Non-shrink grout shall conform to ASTM C1107.
- G. Floor Finish Materials
 - 1. Liquid Chemical Floor Hardeners and Sealers
 - a. Hardener must be a colorless aqueous solution containing a blend of inorganic silicate or silicate material and proprietary components combined with a wetting agent that penetrates, hardens, and densifies concrete surfaces.
 - b. Use concrete penetrating sealers with a low VOC content.
- H. Joint Sealants
 - 1. Horizontal Surfaces, 3 Percent Slope or Less: ASTM C920, Type S or M, Grade P or NS, Class 25, Use T.
 - 2. Vertical Surfaces, Greater Than 3 Percent Slope: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
 - 3. Backer rod shall be closed cell polyethylene foam.

2.8 EMBEDMENTS

- A. Anchor Rods
 - 1. Anchor rods shall comply with Section 05 12 00 Structural Steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and level.

- B. If substrate preparation is the responsibility of another installer, notify the Engineer of unsatisfactory preparation before proceeding.
- C. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify the Engineer and wait for instructions before beginning installation.

3.2 PREPARATION

- A. General
 - 1. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.
 - 2. Roughen surfaces of previously placed concrete as indicated.
 - 3. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.
- B. Subgrade under Foundations and Footings
 - 1. Prepare subgrade or fill under foundations in accordance with the Drawings, Specifications, and project geotechnical report.
- C. Subgrade under Slabs on Ground
 - 1. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.
 - 2. Previously constructed subgrade or fill must be cleaned of foreign materials and inspected by the Contractor for adequate compaction and surface tolerances as specified.
 - 3. Finished surface of subgrade or fill under slabs on ground must not be more than 0.02-feet above or 0.10-feet below elevation indicated.
 - 4. Prepare subgrade or fill surface under slabs on ground as specified for subgrade under foundations and footings.
- D. Edge Forms and Screed Strips for Slabs
 - 1. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment.
 - 2. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.
- E. Reinforcement and Other Embedded Items
 - 1. Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.
 - 2. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum

average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 FORMS

- A. Formwork shall follow recommendations of ACI 347R.
1. General
 - a. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade. Forms submerged in water must be watertight.
 - b. Chamfer above grade exposed joints, edges, and external corners of as indicated. Place chamfer strips in corners of formwork to produce beveled edges on permanently exposed surfaces. Do not bevel reentrant corners or edges of formed joints of concrete.
 - c. Provide formwork with clean-out openings to permit inspection and removal of debris.
 - d. Inspect formwork and remove foreign material before concrete is placed.
 - e. At construction joints, lap form-facing materials over the concrete of previous placement. Ensure formwork is placed against hardened concrete so offsets at construction joints conform to specified tolerances.
 - f. Provide positive means of adjustment (such as wedges or jacks) of shores and struts. Do not make adjustments in formwork after concrete has reached initial setting. Brace formwork to resist lateral deflection and lateral instability.
 - g. Fasten form wedges in place after final adjustment of forms and before concrete placement.
 - h. Provide anchoring and bracing to control upward and lateral movement of formwork system.
 - i. Construct formwork for openings to facilitate removal and to produce opening dimensions as specified and within tolerances.
 - j. Provide runways for moving equipment. Support runways directly on formwork or structural members. Do not support runways on reinforcement. Loading applied by runways must not exceed capacity of formwork or structural members.
 - k. Position and support expansion joint materials, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with removable material to prevent concrete entry into voids.
 - l. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign materials before concrete placement.
 2. Coating
 - a. Cover formwork surfaces with an acceptable material that inhibits bond with concrete.
 - b. If formwork release agent is used, apply to formwork surfaces in accordance with manufacturer's recommendations before placing reinforcement. Remove excess release agent on formwork prior to concrete placement.
 - c. Do not allow formwork release agent to contact reinforcement or hardened concrete against which fresh concrete is to be placed.
 3. Reuse
 - a. Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

4. Form Ties
 - a. After ends or end fasteners of form ties have been removed, repair tie holes in accordance with ACI 301 requirements.
5. Tolerances for Form Construction
 - a. Construct formwork to ensure that, after removal of forms and prior to patching and finishing of formed surfaces, concrete surfaces conform to tolerances specified in ACI 117.
 - b. To maintain specified elevation and thickness within tolerances, install formwork to compensate for deflection and anticipated settlement in formwork during concrete placement. Set formwork and intermediate screed strips for slabs to produce designated elevation, camber, and contour of finished surface before formwork removal. If specified finish requires use of vibrating screeds or roller pipe screeds, ensure that edge forms and screed strips are strong enough to support such equipment.
6. Removal of Forms and Supports
 - a. Do not damage concrete during removal of formwork. Perform needed repair and finishing operations required on exposed surfaces. If forms are removed before end of specified curing period, provide curing and protection.
 - b. If vertical formed surfaces require finishing, remove forms as soon as removal operations will not damage concrete. If forms are removed before end of specified curing period, provide curing and protection.
 - c. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection.
 - d. Formwork not supporting construction loads and weight of concrete, such as sides of beams, walls, columns, and slabs, may be removed once concrete is sufficiently set as to not be damaged by form removal. If forms are removed before end of specified curing period, provide curing and protection.
 - e. Leave formwork and shoring in place to support construction loads and weight of concrete in beams, slabs, and other structural members until the in-place strength of concrete reaches the specified 28-day compressive strength.
 - f. Form-facing material and horizontal facing support members may be removed before in-place concrete reaches specified 28-day compressive strength if shores and other supports are designed to allow facing removal without deflection of supported slab or member.
 - g. Concrete members shall not be subjected to any super-imposed loads until the in-place strength of concrete reaches the specified 28-day compressive strength.
 - h. Special Requirements for Reduced Time Period
 - 1) Forms may be removed earlier than specified if test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a minimum of 85 percent of the specified 28-day compressive strength. This is also applicable to early application of super-imposed loads.

3.4 WATERSTOP INSTALLATION AND SPLICES

- A. Provide waterstops as indicated.

- B. Install formwork to accommodate waterstop materials. Locate waterstops in joints where indicated. Minimize the number of splices in waterstop. Splice waterstops in accordance with manufacturer's written instructions. Install factory-manufactured premolded, mitered corners.
- C. Install waterstops to form a continuous diaphragm in each joint. Make adequate provisions to support and protect waterstops during progress of work. Protect waterstops protruding from joints from damage.
- D. PVC Waterstop
 - 1. Make splices by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. Reform waterstops at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled, must show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.
- E. Rubber Waterstop
 - 1. Rubber waterstops must be spliced using cold bond adhesive as recommended by the manufacturer.
- F. TPER Waterstop
 - 1. Fittings must be shop made using a machine specifically designed to mechanically weld the waterstop. A portable power saw must be used to miter or straight cut the ends to be joined to ensure good alignment and contact between joined surfaces. Maintain continuity of the characteristic features of the cross section of the waterstop (for example ribs, tabular center axis, and protrusions) across the splice.
- G. Hydrophilic Waterstop
 - 1. Miter cut ends to be joined with sharp knife or shears. The ends must be adhered with adhesive.

3.5 REINFORCEMENT

- A. Unless otherwise specified, place reinforcement according to ACI 301. Provide bars, wire fabric, wire ties, supports, and other devices necessary to install and secure reinforcement.
- B. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.
- C. Reinforcement Supports
 - 1. Provide reinforcement support in accordance with CRSI RB4.1 and ACI 301. Place reinforcement and secure with galvanized or non-corrodible chairs, spacers, or metal hangers. For supporting reinforcement on the ground, use concrete or other non-corrodible material having a compressive strength equal to or greater than the concrete being placed.

D. Splicing

1. Splice bars as indicated. For splices not indicated, follow ACI 301. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches. Mechanical splices shall be Type 2.

E. Fabrication

1. Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement and as follows:
 - a. Provide fabrication tolerances that are in accordance with ACI 117.
 - b. Provide standard hooks and bends that as indicated.
 - c. Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not permitted. Bending must be in accordance with standard approved practice and by approved machine methods.
 - d. Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the shop drawings.
 - e. Do not use reinforcement that has any of the following defects:
 - 1) Bar lengths, depths, and bends beyond specified fabrication tolerances.
 - 2) Bends or kinks not indicated on drawings or approved shop drawings.
 - 3) Bars with reduced cross-section due to rusting or other cause.
 - f. Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

F. Placing Reinforcement

1. Place reinforcement in accordance with ACI 301.
2. For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.
3. For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.
4. Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:
 - a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 301 and CRSI MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.
 - b. Equip supports on ground and similar surfaces with sand-plates.
 - c. Support welded wire reinforcement as required for reinforcing bars.
 - d. Secure reinforcements to supports by means of tie wire.

- e. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI 301.
- f. Field bending of reinforcing bars partially embedded in concrete is prohibited unless indicated on the Drawings.

G. Spacing of Reinforcing Bars

- 1. Spacing must be as indicated on the Drawings.
- 2. Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Engineer.

H. Concrete Protection for Reinforcement (Cover)

- 1. Concrete protection must be as indicated on the Drawings.

I. Welding

- 1. Welding of reinforcing is prohibited.

3.6 INSTALLING MISCELLANEOUS MATERIALS

A. Vapor Retarder and Vapor Barrier

- 1. Install in accordance with ASTM E1643. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Concrete placement must not damage material.

B. Rigid Insulation

- 1. Install insulation at locations indicated. Adhesive must be used where insulation is applied to the interior surface of foundation walls and may be used for exterior applications.

C. Embedments

- 1. Anchorage devices and embedded items must be positioned accurately and supported against displacement. Fill openings in anchorage devices such as slots and threaded holes with an approved, removable material to prevent entry of concrete into openings.
- 2. Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.
- 3. Cast-in anchor rods shall be set using a steel or wood template at the top and shall be secured at top and bottom to prevent movement. Anchor placement shall be verified by a licensed surveyor. Tolerances for anchor rod placement are as follows:
 - a. Top of anchor from specified elevation: +/- 1/4 inch.
 - b. Horizontal centerline of individual anchor from specified location: +/- 1/8 inch.
- 4. Apply bituminous coating to all aluminum surfaces in contact with or embedded in concrete.

3.7 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

- A. Comply with ASTM C94, ACI 301, ACI 302.1R, and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.
 - 1. Measuring
 - a. Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."
 - 2. Mixing
 - a. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F.
 - b. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that the specified maximum water-cement ratio are not exceeded. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required.
 - c. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.
 - 3. Transporting
 - a. Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.8 PLACING CONCRETE

- A. Comply with ACI 301. Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other.
- B. General Placement Requirements
 - 1. Deposit concrete continuously or in layers of such thickness that no concrete is placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide

construction joints as specified. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation.

2. Concrete to receive other construction must be screeded to proper level to avoid excessive skimming or grouting.
3. Do not use concrete which becomes nonplastic and unworkable or does not meet quality control limits as specified or has been contaminated by foreign materials. Use of retempered concrete is permitted. Remove rejected concrete from the site.

C. Consolidation

1. During concrete placing operations, consolidate concrete by mechanical vibrating equipment so that concrete is worked around reinforcement and other embedded items and into corners. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.
2. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Provide vibrating equipment adequate in number of units and power of each unit to properly consolidate concrete. Insert and withdraw vibrators vertically at uniformly spaced points not farther apart than visible effectiveness of machine. Do not insert vibrator into lower courses of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of concrete mix.
3. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Consolidate concrete placed in beams and girders of supported slabs and against bulkheads of slabs on ground by mechanical vibrators as specified. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other approved method. Limit consolidation operations to time necessary to obtain consolidation of concrete without bringing an excess of fine aggregate to the surface. Concrete to be consolidated must be as dry as practical and surfaces thereof must not be manipulated prior to finishing operations. Bring concrete correct level with a straightedge and struck-off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Sprinkling of water on plastic surface is not permitted.

D. Pumping

1. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in

pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

E. Cold Weather

1. Comply with ACI 306.1 unless otherwise specified. Do not allow concrete temperature to decrease below specified temperatures. Cover concrete and provide sufficient heat to maintain minimum temperature adjacent to both the formwork and the structure while curing.

F. Hot Weather

1. Comply with ACI 305.1 unless otherwise specified. Maintain required concrete to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

G. Bonding

1. Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface. Obtain bonding of fresh concrete that has set as follows:
 - a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.
 - b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.
 - c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.9 JOINTS

A. Construction Joints

1. Make and locate joints not indicated so as not to impair strength and appearance of the structure. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Locate construction joints as follows:
 - a. In walls, at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of slabs or deepest beam or girder framing into wall.
 - b. In columns or pedestals, at top of footing; at top of slabs on ground; and at underside of slabs or deepest beam or girder framing into column.
 - c. In slabs, within the middle one-third of spans.

B. Isolation Joints in Slabs-on-Ground

1. Provide joints at points of contact between slabs on ground and vertical surfaces such as column pedestals, foundation walls, grade beams, and elsewhere as indicated. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used.
2. Fill joints with preformed joint filler strips extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

C. Contraction Joints in Slabs-on-Ground

1. Provide joints to form panels as indicated.
2. Joints may be saw cut or cut with a jointing tool, to the indicated depth, after the surface has been finished. Saw cutting must be completed within 12 hours of concrete placement. Use of an early-entry saw is preferred.
3. Joints shall be saw cut with an early-entry saw within four hours after placement or as soon as aggregate will not ravel due to saw cut operations.

D. Sealing Joints in Slabs-on-Ground

1. Protect joints from intrusion of foreign matter. Seal joints after concrete curing period.
2. Contraction Joints: Groove shall be filled with joint sealing compound full-depth. For slabs to receive finish flooring, slightly underfill groove. For bare slabs, slightly overfill groove and trim excess sealant flush with slab surface using a razor.
3. Construction and Isolation Joints: Slightly underfill groove with joint sealing compound.

3.10 SURFACE FINISHES EXCEPT FLOOR AND SLAB FINISHES

A. Defects

1. Repair surface defects in accordance with ACI 301.

B. Not Against Forms (Tops of Walls)

1. Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

C. Formed Surfaces

1. As-Cast Rough Form: Provide for surfaces not exposed to public view a surface finish SF-1.0.
2. Standard Smooth Finish: Provide for surfaces exposed to public view a surface finish SF-3.0.

3.11 FLOOR AND SLAB SURFACE FINISHES

- A. Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.
- B. Floated Finish: Use for surfaces to receive roofing and for exterior slabs where not otherwise specified.
- C. Steel Troweled Finish: Use for floors intended as walking surfaces.
- D. Broomed Finish: Use on surfaces of exterior walks, platforms, landings, and ramps, unless otherwise indicated.

3.12 CURING AND PROTECTION

- A. Comply with ACI 301 unless otherwise specified. Begin curing immediately. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating.
- B. Exposed concrete surfaces shall be kept continuously moist for a minimum period of seven days.
- C. Maintain concrete temperatures as follows:
 1. Minimum temperature of 50 degrees F for five continuous days; or
 2. Minimum temperature of 70 degrees F for three continuous days after placement; or
 3. Until concrete has attained final set.

3.13 FIELD QUALITY CONTROL

- A. General
 - 1. Comply with ASTM C1077 for concrete testing.
- B. Sampling
 - 1. Comply with ASTM C172. Collect samples of fresh concrete to perform tests specified.
- C. Testing
 - 1. Slump
 - a. Comply with ASTM C143. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture or by adding water provided that the water-cement ratio is not exceeded.
 - b. Perform tests at commencement of concrete placement; for each batch (minimum) or every 20 cubic yards (maximum) of concrete; and when strength test cylinders are made.
 - 2. Temperature
 - a. Test the concrete delivered and the concrete in the forms. Perform tests hourly in cold or hot weather conditions (below 50 degrees F and above 80 degrees F); for each batch (minimum) or every 20 cubic yards (maximum) of concrete; and whenever strength test cylinders or slump tests are made.
 - 3. Compressive Strength
 - a. Take samples in accordance with ASTM C31. Samples must be taken on a random basis. Each set of cylinders must come from a different batch. Water must not be added to the concrete after sampling. Take precautions to prevent evaporation and loss of water from the specimens.
 - b. Make sufficient test cylinder specimens for each set of tests. Perform strength tests at 7 and 28-days. Hold one test set in reserve for testing at 56 days if the 28-day test fails to meet strength requirements. The reserve set may be discarded if the 28-day test results are satisfactory. Additional strength tests may be required, at the Contractor's option, to justify early form removal or early loading of newly placed concrete.
 - c. Testing Frequency
 - 1) Sample and prepare test cylinders for strength tests of each concrete mixture placed each day, as follows:
 - a) At least once each day.
 - b) At least once for each 150 cubic yards of concrete placed.
 - c) At least once for each 5,000 square feet of surface area for slabs or walls placed.
 - 2) If the total quantity of concrete placed on the project for a given concrete mixture is such that fewer than five strength tests would be performed, sample as follows:
 - a) From at least five randomly selected batches, or:
 - b) From each batch if fewer than five batches are used.

- d. Test samples in accordance with ASTM C39. One strength test shall be the average of the strengths of at least two 6 inch by 12 inch cylinders or at least three 4 inch by 8 inch cylinders made from the same sample.
 - e. Strength test acceptance will be based on the 28- or 56-day test results and will be accepted or rejected based on the criteria of ACI 318.
4. Air Content
- a. Comply with ASTM C173 or ASTM C231 for normal weight concrete.
 - b. Test concrete for air content at the same frequency as slump tests.

D. Strength of Concrete Structure

- 1. The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:
 - a. Failure to meet compressive strength tests as evaluated.
 - b. Reinforcement not conforming to requirements specified.
 - c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
 - d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.
 - e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.
 - f. Poor workmanship likely to result in deficient strength.
- 2. Where the strength of the concrete structure is considered deficient, submit a mitigation or remediation plan for review and approval by the Engineer.

E. Non-Conforming Materials

- 1. Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Engineer to request additional sampling and testing.
- 2. Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Engineer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Owner.

F. Testing Concrete Structure for Strength

- 1. When there is evidence that strength of the concrete structure in place does not meet specification requirements or that there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42, ACI 301, ACI 318, and as follows:
 - a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Engineer.

- b. Test cores after moisture conditioning in accordance with ASTM C42 if concrete they represent is more than superficially wet under service.
 - c. Air dry cores (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.
 - d. Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the specified 28-day compressive strength of the class of concrete and if no single core is less than the specified 28-day compressive strength.
2. Fill core holes solid with patching mortar and finish to match adjacent concrete surfaces.

3.14 REPAIR, REHABILITATION, AND REMOVAL

A. Crack Repair

1. Cracks in excess of 0.02 inches wide must be repaired. The proposed method and materials to repair the cracks must be submitted to the Engineer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

B. Repair of Weak Surfaces

1. Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to the Engineer.

C. Failure of Quality Assurance Test Results

1. Proposed mitigation efforts by the Contractor must be approved by the Engineer prior to proceeding.

END OF SECTION

SECTION 05 12 00 STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers structural steel systems including design, detailing, materials, workmanship, fabrication, assembly, erection, inspection, quality control, and testing.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. The reference shall be taken as the latest version of the publication in effect on the date of issuance of this Specification, except where a specific date is established by code or is stated in the Specification.
- C. American Institute of Steel Construction (AISC)
 - 1. AISC 207 - Standard for Certification Programs
 - 2. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges
 - 3. AISC 325 - Steel Construction Manual
 - 4. AISC 326 - Detailing for Steel Construction
 - 5. AISC 341 - Seismic Provisions for Structural Steel Buildings
 - 6. AISC 360 - Specification for Structural Steel Buildings
- D. American Welding Society (AWS)
 - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination
 - 2. AWS D1.1 - Structural Welding Code - Steel
- E. ASTM International (ASTM)
 - 1. ASTM A6 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
 - 2. ASTM A29 - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
 - 3. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
 - 4. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 5. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 6. ASTM A143 - Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
 - 7. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 8. ASTM A242 - Standard Specification for High-Strength Low-Alloy Structural Steel

9. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
10. ASTM A384 - Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
11. ASTM A385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
12. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
13. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts
14. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
15. ASTM A588 - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
16. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
17. ASTM A992 - Standard Specification for Structural Steel Shapes
18. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
19. ASTM F436 - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
20. ASTM F844 - Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
21. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series
22. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
23. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
24. ASTM F3125 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

- F. Research Council on Structural Connections (RCSC)
1. Specification for Structural Joints Using High-Strength Bolts

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Submittal Procedures:
1. Shop Drawings
 - a. Fabrication and erection drawings
 2. Product Data
 - a. Shop primer
 - b. Welding electrodes and rods
 - c. Direct tension indicator washers
 - d. Non-shrink grout

- e. Tension control bolts
- 3. Design Data
 - a. N/A
- 4. Test Reports
 - a. Mill reports for steel shapes and plates
 - b. Mill reports for bolts, nuts, and washers
 - c. Weld inspection reports
 - d. Bolt installation inspection reports
- 5. Certificates
 - a. AISC fabricator certification
 - b. AISC erector certification
 - c. Certified welding inspector
 - d. Non-destructive testing (NDT) technician

1.4 QUALITY ASSURANCE

- A. Implement and maintain a quality control procedure to ensure inspections, testing, and verifications are completed and documented.
- B. The Contractor shall develop welding procedure specifications for all welding, including welding done using prequalified procedures.
- C. Qualifications
 - 1. Requirements for qualifications shall comply with AISC 207.
 - 2. Fabricator: Company must be AISC-certified for buildings.
 - 3. Erector: Company must be an AISC-certified steel erector.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

- A. Structural steel shapes shall comply with ASTM A6 and the following specifications:
- B. Hot-Rolled Shapes
 - 1. Angles: ASTM A36/A36M.
 - 2. Channels, C and MC: ASTM A36/A36M.
 - 3. Wide flange shapes: ASTM A992/A992M.
 - 4. WT shapes cut from wide flange: ASTM A992/A992M.
- C. Plates
 - 1. ASTM A36/A36M.
 - 2. ASTM A572/A572M.
- D. Hollow Structural Sections
 - 1. Square/Rectangular: ASTM A500/A500M, Grade C.
 - 2. Round: ASTM A500/A500M, Grade C.

- E. Pipe
 - 1. ASTM A53/A53M, Type E or S, Grade B.
- F. Weathering Steel Shapes
 - 1. ASTM A242/A242M, Type 1.
 - 2. ASTM A588/A588M.

2.2 FASTENERS

- A. Provide the following unless indicated otherwise. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade, and type specified by ASTM specifications.
- B. Common Bolts and Threaded Rod
 - 1. ASTM A307, Grade A
- C. High-Strength Bolts
 - 1. ASTM F3125, Grade A325, Type 1.
 - 2. ASTM F3125, Grade A490, Type 1.
- D. Nuts
 - 1. ASTM A563, Grade and Style for applicable ASTM bolt standard recommended.
- E. Washers
 - 1. ASTM F844 washers for ASTM A307 bolts.
 - 2. ASTM F436 washers for Grade A325 and Grade A490 bolts.
- F. Direct Tension Indicator Washers
 - 1. ASTM F959.
- G. "Twist-Off" Type Tension Control Bolts
 - 1. ASTM F3125 GRADE F1852.
 - 2. ASTM F3125 GRADE F2280.

2.3 WEATHERING STRUCTURAL STEEL FASTENERS

- A. High-Strength Bolts
 - 1. ASTM F3125, Grade A325, Type 3.
 - 2. ASTM F3125, Grade A490, Type 3.
- B. Nuts
 - 1. ASTM A563, heavy hex style, Grade DH3, except Grade C3 may be furnished for ASTM A325 bolts.
- C. Washers
 - 1. ASTM F436, weathering steel.

2.4 FOUNDATION EMBEDMENTS

- A. Anchor Rods
 - 1. Comply with ASTM F1554. When Grade 55 anchor rods are provided, either per specification or substitution for Grade 36, they shall comply with supplemental specification S1 for weldability. Additionally, Grade 55 and Grade 105 anchors shall comply with supplemental specification S4 for Charpy Impact requirements.
 - 2. Anchor rods shall be threaded for the length of projection plus 3 inches.
 - 3. When galvanizing is specified, anchors shall be galvanized over the projected length plus 12 inches, at a minimum.
- B. Anchor Nuts
 - 1. ASTM A563, Grade A, heavy hex style for Grade 36 and Grade 55 rods.
 - 2. ASTM A563, Grade D or DH, heavy hex style, for Grade 105 rods.
- C. Anchor Washers
 - 1. ASTM F436, Type 1.
- D. Anchor Plate Washers
 - 1. ASTM A36/A36M.

2.5 STRUCTURAL STEEL ACCESSORIES

- A. Welding Electrodes and Rods
 - 1. AWS D1.1/D1.1M, E70XX, compatible with base material.
- B. Non-Shrink Grout
 - 1. ASTM C1107/C1107M, nonshrink, non-metallic.
- C. Headed Stud-Type Shear Connectors
 - 1. ASTM A29 and AWS D1.1/D1.1M.

2.6 COATINGS

- A. Hot-Dip Galvanizing
 - 1. Steel materials which will be hot-dip galvanized shall comply with the elemental compositions recommended by ASTM A385 to ensure high quality coatings.
 - 2. Grade 490 and Grade F2280 bolts shall not be used when hot-dip galvanizing is specified.

PART 3 EXECUTION

3.1 SHOP AND ERECTION DRAWINGS

- A. Prepare shop and erection drawings in accordance with applicable provisions of AISC 303, AISC 325, AISC 326, and AISC 360.
- B. Submit fabrication and erection drawings for review and acceptance prior to fabrication.

- C. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts.
- D. Double connections that require an erection seat to comply with OSHA 29 CFR 1926.756(c)(1) shall be shown on the shop drawings, reviewed and approved by the structural engineer of record.
- E. Use AWS A2.4 standard welding symbols.
- F. Shoring and temporary bracing shall be designed and sealed by a licensed professional engineer.
- G. Adequate drainage holes shall be provided to eliminate water traps. Hole diameter shall be 1/2 inch and location shall be indicated on the detail drawings. Hole size and location shall not affect the structural integrity.
- H. Where specified on the Drawings, connections not detailed shall be designed in accordance with AISC 360 and AISC 341, as applicable.
- I. Detailing for Hot-Dip Galvanizing
 1. All field connections for galvanized structures shall be bolted. Field welding is not permitted.
 2. Detail for galvanizing per recommendations of the American Galvanizer's Association and ASTM A385, including seal welds.
 3. Adequate vent and drain holes shall be provided. Hole size and location shall not affect the structural integrity. At tee-type connections for HSS and pipe, holes in the HSS or pipe wall are not permitted.

3.2 FABRICATION

- A. Fabrication shall not commence until the shop and erection drawings have been reviewed and accepted.
- B. Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible.
- C. Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Engineer.
- D. Punch, sub-punch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning.
- E. Welding
 1. All welding shall be performed in accordance with AWS D1.1/D1.1M. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.
 2. Grind exposed welds smooth as indicated.

3. Remove temporary welds and run-off plates and grind smooth in areas to be finished or where they would interfere with fireproofing.

F. Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dip galvanized members.

3.3 COATINGS

A. Hot-Dip Galvanizing

1. Unless specified otherwise, all exterior steel members and fasteners shall be hot-dip galvanized after fabrication. Galvanizing shall comply with the following requirements:

- a. ASTM A123/A123M, iron and steel products.
- b. ASTM A143/A143M, embrittlement.
- c. ASTM A153/A153M, iron and steel hardware.
- d. ASTM A384/A384M, warpage and distortion.
- e. ASTM A385/A385M, quality.
- f. ASTM F2329/F2329M, fasteners.

3.4 ERECTION

A. Erection of structural steel, except as indicated below, shall be in accordance with the applicable provisions of AISC 325.

B. Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

C. Base Plates and Anchors

1. Grouted Base Plate: After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout where specified. Place nonshrink grout in accordance with the manufacturer's printed installation instructions.
2. Leveling Nut Base Plate: After final positioning of steel members, adjust bottom nuts to ensure full bearing on the bottom of the plate. Tighten the top nuts to the snug tight condition.
3. Anchor rods shall be snug tightened by hand. Do not tighten anchor rods set in concrete with impact wrenches.

D. Connections

1. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.
2. Common Grade Bolts: ASTM A307 bolts shall be tightened to a "snug tight" fit.
3. High Strength Bolts: Unless noted otherwise, A325 bolts shall be tightened to a "snug tight" fit. Where pretensioning is specified, bolts shall be fully tensioned to 70 percent

- of their minimum tensile strength. Bolts shall be installed per one of the methods specified by RCSC.
4. Direct Tension Indicating Washers: Install per the manufacturers printed installation instructions and the requirements of RCSC. Based on which element will be turned, properly place washers per RCSC.
- E. Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted unless approval has been obtained from the Engineer.
- F. Shop Primer Repair
1. Where applicable repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, drilling, welding, or bolting.
- G. Galvanizing Repair
1. Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, drilling, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.5 QUALITY CONTROL

- A. Perform shop and field tests, and provide labor, equipment, and incidentals required for testing. The Owner shall be notified in writing of defective welds, bolts, nuts, and washers within 3 working days of the date of inspection.
- B. The Owner, at his discretion, reserves the right to conduct third-party inspections at the fabrication shop or the project site.
- C. Shop Quality Control
1. Performing welding inspections per AWS D1.1/D1.1M.
 2. The Contractor shall inspect proper preparation, size, gaging location, and acceptability of welds; identification marking; operation and current characteristics of welding sets in use.
 3. Test for embrittlement per ASTM A143/A143M after fabrication.
- D. Field Quality Control
1. High-Strength Bolts: Inspection procedures shall be in accordance with AISC 360. Confirm that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

END OF SECTION

SECTION 26 05 00.00 40
COMMON WORK RESULTS FOR ELECTRICAL

CONTENTS

1. GENERAL1

 1.1 REFERENCES.....1

 1.2 DEFINITIONS.....2

 1.3 SUBMITTALS.....2

 1.4 PREVENTION OF CORROSION2

2. PRODUCTS3

3. EXECUTION3

 3.1 INSTALLATION.....3

 3.2 CONDUITS, RACEWAYS AND FITTINGS.....3

 3.3 WIRING.....6

 3.4 FIELD TESTING.....7

1. GENERAL

1.1 REFERENCES

All materials, equipment, and methods shall be as shown on the drawings and specified in the representative Bill of Materials (BOM). If not specified otherwise in those documents, the materials and procedures specified in this section shall govern. Where in conflict, the drawings and BOM shall take precedence over these specifications. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

A. ASTM INTERNATIONAL (ASTM)

1. ASTM D709 - Laminated Thermosetting Materials

B. ELECTRONIC INDUSTRIES ALLIANCE (EIA)

1. EIA 480 - Toggle Switches

C. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

1. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
2. IEEE C2 - (2023) National Electrical Safety Code
3. IEEE C57.12.28 - Standard for Pad-Mounted Equipment - Enclosure Integrity
4. IEEE C57.12.29 - Standard for Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments
5. IEEE Stds Dictionary - IEEE Standards Dictionary: Glossary of Terms & Definitions

D. INTERNATIONAL CODE COUNCIL (ICC)

1. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities

E. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1. ANSI Z535.1 - American National Standard for Safety--Color Code
2. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
3. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
4. NEMA FB 1 - Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
6. NEMA PB 1 - Panelboards
7. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
8. NEMA TC 2 - Standard for Electrical Polyvinyl Chloride (PVC) Conduit
9. NEMA TC 3 - Standard for Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
10. NEMA VE 1 - Standard for Metal Cable Tray Systems
11. NEMA WD 1 - Standard for General Color Requirements for Wiring Devices

12. NEMA WD 6 - Wiring Devices Dimensions Specifications

F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 70E - (Latest edition) Standard for Electrical Safety in the Workplace
2. NFPA 70 (2023; Errata 2 2012 per 527 CMR 12.00 Massachusetts Electrical Code) National Electrical Code

G. UNDERWRITERS LABORATORIES (LATEST EDITION)

1. UL 1 - Standard for Flexible Metal Conduit
2. UL 1242 - Standard for Electrical Intermediate Metal Conduit -- Steel
3. UL 467 - Grounding and Bonding Equipment
4. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
5. UL 498 - Attachment Plugs and Receptacles
6. UL 6 - Electrical Rigid Metal Conduit-Steel
7. UL 797 - Electrical Metallic Tubing -- Steel
8. UL 854 - Standard for Service-Entrance Cables
9. UL 870 - Standard for Wireways, Auxiliary Gutters, and Associated Fittings
10. UL 943 - Ground-Fault Circuit-Interrupters

1.2 DEFINITIONS

- A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Stds Dictionary.
- B. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- C. Vertical assembly: A vertical assembly is a pole, tower or other such support, mounting hardware, arms, brackets and the load. Load can be a luminaire, siren, loudspeaker or other device. All components of a vertical assembly will be rated by the manufacturer to withstand 135 mph wind loading.

1.3 SUBMITTALS

Engineer approval is required for submittals with an "E" designation; submittals not having an "E" designation are for Contractor Quality Control approval and/or Owner information only.

1.4 PREVENTION OF CORROSION

Protect metallic materials against corrosion. Do not use aluminum when in contact with earth or concrete and, where connected to dissimilar metal, protect by approved fittings and treatment. Ferrous metals such as, but not limited to, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous spare parts not of corrosion-resistant steel shall be hot-dip galvanized except where other equivalent protective treatment is specifically approved in writing.

2. PRODUCTS

SECTION NOT USED

3. EXECUTION

3.1 INSTALLATION

Electrical installations, including weatherproof locations and ducts, plenums and other air-handling spaces, shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

3.2 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 5 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

A. RIGID STEEL CONDUIT

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than 2-1/2 inches shall be long radius.

Provide all conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, with a flush coupling when the floor slab is of sufficient thickness.

Otherwise, provide a floor box set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

B. SURFACE RACEWAYS AND ASSEMBLIES

Surface raceways shall be mounted plumb and level, with the base and cover secured. Minimum circuit run shall be three-wire with one wire designated as ground.

C. CABLE TRAYS

Support cable trays from ceiling hangers, equipment bays, or floor or wall supports. Cable trays may be mounted on equipment racks. Provide support when the free end extends beyond 3 feet. Maximum support spacing shall be 5 feet. Trays 10-inches wide or less shall be supported by one hanger. Trays greater than 10-inches wide shall be supported by two hangers. Bond cable trays at splices.

D. STUB-UPS

Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

E. CONDUIT SUPPORT

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Where conduit crosses building expansion joints, provide suitable expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

F. DIRECTIONAL CHANGES IN CONDUIT RUNS

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

G. LOCKNUTS AND BUSHINGS

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures.

Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

H. CABLE TRAY INSTALLATION

Install and ground in accordance with NFPA 70. Install cable trays parallel with or at right angles to ceilings, walls, and structural members. Support in accordance with manufacturer recommendations but at not more than 5 foot intervals. Contact surfaces of aluminum connections shall be coated with an antioxidant compound prior to assembly. Adjacent cable tray sections shall be bonded together by connector plates of an identical type as the cable tray sections. For grounding of cable tray system provide No. 2 AWG bare copper wire throughout cable tray system, and bond to each section, except use No. 1/0 aluminum wire if cable tray is aluminum. Terminate cable trays 10 inches from both sides of smoke and fire partitions. Conductors run through smoke and fire partitions shall be installed in 4 inch rigid steel conduits with grounding bushings, extending 12 inches beyond each side of partitions. Seal conduit on both ends to maintain smoke and fire ratings of partitions. Penetrations shall be firestopped. Provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

I. GROUNDING AND BONDING

Provide in accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, access flooring support system, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, grounding conductor of nonmetallic sheathed cables, and neutral conductor of wiring systems. Make ground connection to driven ground rods on exterior of building. Interconnect all grounding media in or on the structure to provide a common ground potential. This shall include lightning protection, electrical service, telecommunications system grounds, as well as underground metallic piping systems. Use main size lightning conductors for interconnecting these grounding systems to the lightning protection system. In addition to the requirements specified herein, provide telecommunications grounding in accordance with TIA J-STD-607. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

1. Ground Rods:

Provide cone pointed ground rods. The resistance to ground shall be measured using the fall-of-potential method described in IEEE 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, additional rods not less than 6 feet on centers shall be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify the Owner who will decide on the number of ground rods to add.

2. Grounding Connections:

Make grounding connections which are buried or otherwise normally inaccessible, excepting specifically those connections for which access for periodic testing is required, by exothermic weld or compression connector.

- Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
 - Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.
3. Ground Bus:
A copper ground bus shall be provided in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of electrical equipment shall be effectively grounded by bonding to the ground bus. The ground bus shall be bonded to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment. For raised floor equipment rooms, a minimum of 4, one at each corner, ground buses shall be provided and connected to the building grounding system. Connections shall be bolted type in lieu of thermoweld, so they can be changed as required by additions and/or alterations.
4. Resistance:
Maximum resistance-to-ground of grounding system shall not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Owner for further instructions.

3.3 WIRING

- A. Feeder and branch circuit conductors shall be color coded as follows:

CONDUCTOR	COLOR AC
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equipment Grounds	Green

- B. Conductors up to and including AWG No. 2 shall be manufactured with colored insulating materials. Conductors larger than AWG No. 2 shall have ends identified with color plastic tape in outlet, pull, or junction boxes.
- C. Splice in accordance with the NFPA 70. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

3.4 FIELD TESTING

- A. Furnish test equipment and personnel and submit written copies of test results. Give Owner 5 working days notice prior to each test.
- B. Submit Test Reports in accordance with referenced standards in this section.
- C. Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.
- D. After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.
- E. Contractor shall provide all necessary test equipment, labor, and personnel to perform the tests, as herein specified.
- F. Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Substation and switchboard feeder breakers, circuit breakers in panel boards, and other disconnecting devices shall be used to isolate the circuits under test.
- G. Perform insulation-resistance test on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes 8AWG and smaller insulation resistance testing is not required.
- H. Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 25,000,000 ohms.
- I. Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Owner, and indicate location of rods as well as resistance and soil conditions at time measurements were made.
- J. Perform continuity test to insure correct cable connection (i.e correct phase conductor, grounded conductor, and grounding conductor wiring) end-to end. Any damages to existing or new electrical equipment resulting from contractor miss-wiring will be repaired and re-verified at contractor's expense. All repairs shall be approved by the Owner prior to acceptance of the repair.

- K. Conduct phase-rotation tests on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment clockwise, facing the source.
- L. Final acceptance will depend upon the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved by the Owner.

SECTION 26 11 14.00 10
MAIN ELECTRIC SUPPLY STATION AND SUBSTATION

Contents

1. GENERAL2

 1.1 REFERENCES.....2

 1.2 SYSTEM DESCRIPTION4

 1.3 SUBMITTALS.....5

2. EXECUTION6

 2.1 EXAMINATION6

 2.2 GENERAL INSTALLATION REQUIREMENTS6

 2.3 EQUIPMENT INSTALLATION.....7

 2.4 ELECTRICAL BUS CONNECTIONS7

 2.5 FIELD TESTING.....7

 2.6 ACCEPTANCE7

1. GENERAL

1.1 REFERENCES

All materials, equipment, and methods shall be as shown on the drawings and specified in the representative Bill of Materials (BOM). If not specified otherwise in those documents, the materials and procedures specified in this section shall govern. Where in conflict, the drawings and BOM shall take precedence over these specifications. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

A. AMERICAN WELDING SOCIETY (AWS)

1. AWS D1.1/D1.1M - Structural Welding Code - Steel

B. ASME INTERNATIONAL (ASME)

1. ASME B31.3 - Process Piping
2. ASME BPVC SEC IX - BPVC Section IX-Welding and Brazing Qualifications

C. ASTM INTERNATIONAL (ASTM)

1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
3. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
4. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
5. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
6. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
7. ASTM A633/A633M - Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates
8. ASTM B231/B231M - Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors
9. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
10. ASTM D2472 - Standard Specification for Sulphur Hexafluoride
11. ASTM D4059 - Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography
12. ASTM D923 - Standard Practice for Sampling Electrical Insulating Liquids

D. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

1. IEEE 32 - Standard Requirements, Terminology, and Test Procedures for Neutral Grounding Devices
2. IEEE 484 - (2002; R 2008) Recommended Practice for Installation Design and Implementation of Vented Lead-Acid Batteries for Stationary Applications

3. IEEE 485 - (2010) Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications
4. IEEE 525 - (2007) Guide for the Design and Installation of Cable Systems in Substations
5. IEEE 693 - Seismic Design of Substations
6. IEEE 80 - Guide for Safety in AC Substation Grounding
7. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
8. IEEE C2 - National Electrical Safety Code
9. IEEE C37.081 - Guide for Synthetic Fault Testing of AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
10. IEEE C37.09 - Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
11. IEEE C37.1 - Standard for Supervisory Control, Data Acquisition (SCADA) and Automatic Systems
12. IEEE C37.121 - American National Standard for Switchgear-Unit Substations - Requirements
13. IEEE C37.13 - Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures
14. IEEE C37.16 - Standard for Preferred Ratings, Related Requirements, and Application Recommendations for Low-Voltage AC (635 V and below) and DC 3200 V and below) Power Circuit Breakers
15. IEEE C37.30 - Standard Requirements for High-Voltage Switches
16. IEEE C37.32 - Standard for High-Voltage Switches, Bus Supports, and Accessories - Schedules of Preferred Ratings, Construction Guidelines and Specifications
17. IEEE C37.34 - Standard Test Code for High-Voltage Air Switches
18. IEEE C37.41 - Standard Design Tests for High-Voltage (>1000 V) Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories Used with These Devices
19. IEEE C37.46 - Standard for High Voltage Expulsion and Current-Limiting Type Power Class Fuses and Fuse Disconnecting Switches
20. IEEE C37.90.1 -) Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
21. IEEE C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
22. IEEE C57.12.10 - Standard for Transformers 230 kV and Below 833/958 through 8333/10,417 kVA, Single-Phase, and 750/862 through 60,000/80,000/ 100,000 kVA, Three-Phase Without Load Tap Changing; and 3750/4687 through 60,000/80,000/100,000 kVA With Load Tap Changing - Safety Requirements
23. IEEE C57.12.90 - Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers
24. IEEE C57.13 - Standard Requirements for Instrument Transformers
25. IEEE C57.15 - Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators
26. IEEE C57.19.00 - Standard General Requirements and Test Procedures for Outdoor Power Apparatus Bushings
27. IEEE C57.19.01 - Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings

28. IEEE C57.93 - Guide for Installation and Maintenance of Liquid-Immersed Power Transformers
29. IEEE C57.98 - Guide for Transformer Impulse Tests
30. IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV)

E. INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

1. IEC 60255-21-3 - Electrical Relays - Part 21: Vibration, Shock, Bump And Seismic Tests On Measuring Relays And Protection Equipment - Section 3: Seismic Tests; Ed 1.0

F. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1. ANSI C29.1 - American National Standard for Electrical Power Insulators--Test Methods
2. ANSI C29.2 - American National Standard for Insulators - Wet-Process Porcelain and Toughened Glass - Suspension Type
3. ANSI C29.9 - American National Standard for Wet-Process Porcelain Insulators - Apparatus, Post-Type
4. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
5. NEMA LA 1 - Standard for Surge Arresters
6. NEMA PB 1 - Panelboards
7. NEMA WD 1 - Standard for General Color Requirements for Wiring Devices
8. NEMA/ANSI C12.11 - Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV)

G. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 70 - (2023; Errata 2 2012 per 527 CMR 12.00 Massachusetts Electrical Code) National Electrical Code

H. UNDERWRITERS LABORATORIES (UL)

1. UL 1236 - Standard for Battery Chargers for Charging Engine-Starter Batteries
2. UL 467 - Grounding and Bonding Equipment
3. UL 486A-486B - Wire Connectors
4. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
5. UL 50 - Enclosures for Electrical Equipment, Non-environmental Considerations
6. UL 6 - Electrical Rigid Metal Conduit-Steel
7. UL 67 - Standard for Panelboards

1.2 SYSTEM DESCRIPTION

A. GENERAL

Provide the system as specified, and include structures, incoming and outgoing lines, transformers, fuses, circuit breakers, switches, and all other appurtenances and accessories as described herein, shown on the drawings and necessary to provide a fully functional system.

B. SERVICE CONDITIONS

Items provided under this section shall be specifically suitable for the following service conditions. Seismic details shall conform to the requirements of IEEE 693 as indicated.

1. Altitude 550+/- feet
2. Ambient Temperature 60 degrees F degrees F
3. Frequency 60 Hz
4. Ventilation per IEEE standards cfm
5. Seismic Parameters per IEEE 693
6. Outside conditions per ASHRAE 2021 BEVERLY, MA, USA (WMO: 725088)

C. AS-BUILT DRAWINGS

The as-built drawings shall be kept at the job site and updated daily. The as-built drawings shall be a full sized set of prints marked to reflect all deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. Drawings shall be marked with Green - deletions, Red - Additions, and Blue - Comments, Notes, Drafting Aid. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Owner monthly. Upon completion of the work, submit one (1) full sized set of the marked prints to the Engineer for incorporation into the Record Drawings. Keep as-built drawings prepared as a record of the construction as installed. Include in the drawings all the information shown on the contract drawings as well as all deviations, modifications, and changes from the contract drawings, however minor. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction.

1.3 SUBMITTALS

Engineer approval is required for submittals with an "E" designation; submittals not having an "E" designation are for Contractor Quality Control approval and information only. Submit the following:

A. SD-02 Shop Drawings

1. General Installation Requirements
2. Detail Drawings
3. As-Built Drawings, E

B. SD-03 Product Data

1. Support Structures, E
2. Battery, E
3. Nameplates
4. Materials and Equipment
5. General Installation Requirements
6. Onsite Tests, E

C. SD-06 Test Reports

1. Factory Tests, E
2. Field Testing, E
3. Field Test Reports, E

D. SD-07 Certificates

1. Materials and Equipment

E. SD-10 Operation and Maintenance Data

1. Operation and Maintenance Manuals

2. EXECUTION

2.1 EXAMINATION

After becoming familiar with details of the work, verify dimensions in the field, and notify the Engineer of any discrepancy before performing any work.

2.2 GENERAL INSTALLATION REQUIREMENTS

Install and energize equipment and devices in accordance with the manufacturer's published instructions. Submit installation procedures for station buses and insulators, station structures, transformers, circuit interrupters, control house, and battery system, as a minimum. Procedures shall include diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment. Circuits installed in conduits or underground and splices and terminations for medium-voltage cable shall conform to the requirements of Section 33 71 02 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND. Secondary circuits installed in conduit on poles shall conform to the requirements of Section 26 05 00.00 40 COMMON WORK ELECTRICAL.

A. CONFORMANCE TO CODES

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2.

B. CONCRETE FOUNDATIONS

1. Structure Foundation Installation

Bolt each column to a concrete foundation by at least four bolts spaced to transmit structure stresses to the foundation. Diameters and lengths of foundation bolts shall be as shown on the drawings or recommended by the structure manufacturer. Embed bolts in concrete in a manner to develop their full strength. Anchor bolts shall be accurately set in foundations using templates supplied by the structure manufacturer or as approved by Engineer. Columns shall then be set on baseplates, leveled on foundations, and secured with holding nuts. Concrete work and grouting shall comply with the requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE.

2. Concrete Pads

Construct concrete pads for pad-mounted electrical equipment as indicated. Tops of concrete pads shall be level and shall project six inches above finished grade, unless

otherwise shown on the drawings, and sloped to drain. Set conduits for primary, secondary, and grounding conductors in place prior to placing of the concrete pads. Concrete work shall comply with the requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE.

- Concrete pads to support pad mounted electrical equipment shall be reinforced with steel reinforcing rods at 12" inches, on center, each way or as shown on the drawings. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection. When the installation is complete, seal all conduit and other entries into the equipment housing with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, and foreign matter.

C. SURFACE TREATMENT

Horizontal spaces between concrete foundations or pads and fences shall be excavated to the depth shown on the drawings, and filled with gravel base material and the crushed stone layer as shown on drawings

2.3 EQUIPMENT INSTALLATION

2.4 ELECTRICAL BUS CONNECTIONS

All connections to aluminum bus shall be cleaned and coated with an inhibitor in accordance with manufacturer's recommended methods. All bolted connections shall be torqued to the correct tightness. Establish a checklist to insure that bolted connections have been properly coated and correctly torqued. All welded connections on aluminum bus work shall be by the gas metal-arc welding process. The shield inert gas shall be argon. The welder shall be certified for gas metal-arc welding.

2.5 FIELD TESTING

A. SAFETY

Provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. Replace any devices or equipment which are damaged due to improper test procedures or handling.

B. GROUND-GRID CONNECTION INSPECTION

All below-grade ground-grid connections will be visually inspected before backfilling.

2.6 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all work, the work has been inspected by Ipswich ELD, and after all defects in installation material or operation have been corrected.

SECTION 33 71 02
UNDERGROUND ELECTRICAL

Contents

1.	GENERAL	1
1.1	REFERENCES.....	1
1.2	DEFINITIONS.....	5
2.	PRODUCTS	5
2.1	PULL ROPE	5
3.	EXECUTION	5
3.1	INSTALLATION.....	5
3.2	CABLE INSPECTION	6
3.3	CABLE INSTALLATION PLAN AND PROCEDURE.....	6
3.4	UNDERGROUND CONDUIT AND DUCT SYSTEMS	7
3.5	EXCAVATING, BACKFILLING, AND COMPACTING.....	9
3.6	CAST-IN-PLACE CONCRETE.....	10

1. GENERAL

1.1 REFERENCES

All materials, equipment, and methods shall be as shown on the drawings and specified in the representative Bill of Materials (BOM). If not specified otherwise in those documents, the materials and procedures specified in this section shall govern. Where in conflict, the drawings and BOM shall take precedence over these specifications. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1. C2 - National Electrical Safety Code.
2. C8.35 - Specifications for Weather-Resistant Polyolefin-Covered Wire and Cable.
3. C29.1 - Test Methods for Electrical Power Insulators
4. C29.2 - Insulators - Wet-Process Porcelain and Toughened Glass - Suspension Type.
5. C29.3 - Wet-Process Porcelain Insulators - Spool Type.
6. C29.4 - Wet-Process Porcelain Insulators - Strain Type.
7. C29.5 - Wet-Process Porcelain Insulators - Low and Medium Voltage Types.
8. C29.6 - Wet-Process Porcelain Insulators - High-Voltage Pin Type.
9. C29.7 - Wet-Process Porcelain Insulators - High-Voltage Line-Post Type.
10. C29.8 - Wet-Process Porcelain Insulators - Apparatus, Cap and Pin Type.
11. C29.9 - Wet-Process Porcelain Insulators - Apparatus, Post-Type.
12. C37.30 - Definitions and Requirements for High-Voltage Air Switches, Insulators, and Bus Supports.
13. C57.12.20 - Transformers - Overhead-Type Distribution Transformers, 500 kVA and Smaller: High-Voltage 34,500 Volts and Below; Low-Voltage, 7970/13,800Y Volts and Below.
14. C119.4 - Electric Connectors - Connectors for Use Between Aluminum-To-Aluminum or Aluminum-To-Copper Bare Overhead Conductors.
15. C135.1 - Galvanized Steel Bolts and Nuts for Overhead Line Construction.
16. C135.14 - Staples with Rolled or Slash Points for Overhead Line Construction.
17. C135.17 - Galvanized Ferrous Bolt-Type Insulator Pins with Lead Threads for Overhead Line Construction.
18. C135.22 - Galvanized Ferrous Pole-Top Insulator Pins with Lead Threads for Overhead Line Construction.
19. C135.30 - Galvanized Ferrous Ground Rods for Overhead or Underground Line Construction.
20. C135.33 - Galvanized Ferrous Crossarm Gains for Overhead Line Construction.
21. Z55.1 - Gray Finishes for Industrial Apparatus and Equipment
22. 05.1 - Specifications and Dimensions for Wood Poles.

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS:

1. A123 REV A - Standard Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products.
2. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. A475 - Standard Specification for Zinc-Coated Steel Wire Strand.
4. A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
5. A576 REV B - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
6. B1 - Standard Specification for Hard-Drawn Copper Wire.
7. B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
8. B117 - Standard Test Method of Salt Spray (Fog) Testing.
9. B228 - Standard Specification for Concentric-Lay-Stranded Copper-Clad Steel Conductors.
10. B230 - Standard Specification for Aluminum 1350-H19 Wire for Electrical Purposes.
11. B231 - Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors.
12. B232 - Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR).
13. B398 - Standard Specification for Aluminum-Alloy 6201-T81 Wire for Electrical Purposes.
14. B399 - Standard Specification for Concentric-Lay-Stranded Aluminum-Alloy 6201-T81 Conductors.
15. B416 - Standard Specification for Concentric-Lay-Stranded Aluminum-Clad Steel Conductors.
16. B498 - Standard Specification for Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR).
17. D923 - Standard Methods of Sampling Electrical Insulating Liquids.
18. D3304 - Analysis of Environmental Materials for Polychlorinated Biphenyls.

C. AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

1. C4 - Poles - Preservative Treatment by Pressure Processes.
2. C25 - Sawn Crossarms - Preservative Treatment by Pressure Processes.
3. P1 - Coal Tar Creosote for Land and Fresh Water Use.
4. P5 - Waterborne Preservatives.
5. P8 - Oil-Borne Preservatives.
6. P9 - Solvents and Formulations for Organic Preservative Systems.

D. ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

1. AEIC CS8 - Extruded Dielectric Shielded Power Cables Rated 5 Through 46 kV

E. ASTM INTERNATIONAL (ASTM)

1. ASTM B1 - Standard Specification for Hard-Drawn Copper Wire

2. ASTM B231/B231M - Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors
3. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire
4. ASTM B400 - Standard Specification for Compact Round Concentric-Lay-Stranded Aluminum 1350 Conductor
5. ASTM B609/B609M - Standard Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical purposes
6. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
7. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes-Annealed and Intermediate Tempers
8. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation
9. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
10. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
11. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
12. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
13. ASTM F512 - Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation

F. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

1. IEEE 24 - Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings
2. IEEE 100 - (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
3. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems
4. IEEE 386 - Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V
5. IEEE 400.2 - Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
6. IEEE 404 - Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500,000 V
7. IEEE 48 - Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
8. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
9. IEEE C2 - (2023) National Electrical Safety Code
10. IEEE C37.20.3 - Standard for Metal-Enclosed Interrupter Switchgear

G. INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

1. NETA ATS - (2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

H. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1. ANSI C119.1 - Electric Connectors - Sealed Insulated Underground Connector Systems Rated 600 Volts
2. NEMA HV 2 - Application Guide for Ceramic Suspension Insulators
3. NEMA LA 1 - Surge Arresters
4. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
5. NEMA SG 2 - High Voltage Fuses
6. NEMA TC 2 - Standard for Electrical Polyvinyl Chloride (PVC) Conduit
7. NEMA TC 6 & 8 - Standard for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations
8. NEMA TC 9 - Standard for Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation
9. NEMA WC 5 (Rev 1-14) - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
10. NEMA WC 7 - Cross-linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
11. NEMA WC 8 - Ethylene-Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
12. NEMA WC 74/ICEA S-93-639 - 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy

I. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 70 - (2023; Errata per 527 CMR 12.00 Massachusetts Electrical Code) National Electrical Code

J. TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

1. TIA-758 - Customer-Owned Outside Plant Telecommunications Infrastructure Standard

K. U.S. DEPARTMENT OF AGRICULTURE (USDA)

1. RUS Bull 1751F-644 - (2002) Underground Plant Construction
- 1.1.K.1 U.S. DEPARTMENT OF AGRICULTURE (USDA), RURAL ELECTRIFICATION ADMINISTRATION (REA)
2. DT-5B:PE-16 - Wood Crossarms (Solid and Laminated Transmission Timbers and Pole Keys)

L. U.S. GENERAL SERVICES ADMINISTRATION (GSA)

1. CID A-A-60005 - (Basic; Notice 2) Frames, Covers, Gratings, Steps, Sump And Catch Basin, Manhole

M. UNDERWRITERS LABORATORIES (UL)

1. UL 1072 Medium-Voltage Power Cables
2. UL 1242) Standard for Electrical Intermediate Metal Conduit -- Steel
3. UL 44 - Thermoset-Insulated Wires and Cables
4. UL 467 -) Grounding and Bonding Equipment
5. UL 486A-486B Wire Connectors
6. UL 510 - Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
7. UL 514A - Metallic Outlet Boxes
8. UL 514B - Conduit, Tubing and Cable Fittings
9. UL 6 - Electrical Rigid Metal Conduit-Steel
10. UL 651 - Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
11. UL 83 - Thermoplastic-Insulated Wires and Cables
12. UL 854 - Standard for Service-Entrance Cables

1.2 DEFINITIONS

- A. UNLESS OTHERWISE SPECIFIED OR INDICATED, ELECTRICAL AND ELECTRONICS TERMS USED IN THESE SPECIFICATIONS, AND ON THE DRAWINGS, SHALL BE AS DEFINED IN IEEE 100.
- B. IN THE TEXT OF THIS SECTION, THE WORDS CONDUIT AND DUCT ARE USED INTERCHANGEABLY AND HAVE THE SAME MEANING.
- C. IN THE TEXT OF THIS SECTION, "MEDIUM VOLTAGE CABLE SPLICES," AND "MEDIUM VOLTAGE CABLE JOINTS" ARE USED INTERCHANGEABLY AND HAVE THE SAME MEANING.

2. PRODUCTS

Refer to Section 26 05 00.00 40 - COMMON WORK ELECTRICAL (provided with the Substation construction specifications).

2.1 PULL ROPE

Shall be plastic or flat pull line (bull line) having a minimum tensile strength of 200 pounds

3. EXECUTION

3.1 INSTALLATION

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable. In addition to these requirements, install telecommunications in accordance with TIA-758 and RUS Bull 1751F-644.

3.2 CABLE INSPECTION

Prior to installation, each cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable prior to installation in accordance with the cable manufacturer's recommendations.

3.3 CABLE INSTALLATION PLAN AND PROCEDURE

The Contractor shall obtain from the manufacturer an installation manual or set of instructions that addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature limits for installation, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, maximum allowable pulling tension, and maximum allowable sidewall bearing pressure. The Contractor shall then perform pulling calculations and prepare a pulling plan which shall be submitted along with the manufacturer's instructions in accordance with SUBMITTALS. Cable shall be installed strictly in accordance with the cable manufacturer's recommendations and the approved installation plan.

Calculations and pulling plan shall include:

- A. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.
- B. List of cable installation equipment.
- C. Lubricant manufacturer's application instructions.
- D. Procedure for resealing cable ends to prevent moisture from entering cable.
- E. Cable pulling tension calculations of all cable pulls.
- F. Cable percentage conduit fill.
- G. Cable sidewall bearing pressure.
- H. Cable minimum bend radius and minimum diameter of pulling wheels used.
- I. Cable jam ratio.
- J. Maximum allowable pulling tension on each different type and size of conductor.
- K. Maximum allowable pulling tension on pulling device.

L. PRECAST CONCRETE CONSTRUCTION

Set commercial precast structures on 12 inches of level, 90 percent compacted granular fill, 3/4 inch to 1 inch size, extending 12 inches beyond the structure on each side. Compact granular fill by a minimum of four passes with a plate type vibrator. Installation shall additionally conform to the manufacturer's instructions.

M. TRENCHING

Trenches for direct-burial cables shall be excavated to depths required to provide the minimum necessary cable cover. When rock is encountered, remove to a depth of at least 6 inches below the cable and fill the space with sand per the drawings. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where materials in bottoms of trenches are other than sand, a 6 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil. Trenches shall be not less than the width shown on the drawings and shall be in straight lines between cable markers. Bends in trenches shall have a radius consistent with the cable manufacturer's published minimum cable bending radius for the cable installed.

3.4 UNDERGROUND CONDUIT AND DUCT SYSTEMS

A. REQUIREMENTS

Depths to top of the conduit shall be in accordance with NFPA 70. Run conduit in straight lines except where a change of direction is necessary. Numbers and sizes of ducts shall be as indicated. Ducts shall have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of 3 inches per 100 feet or as shown on Drawings. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in structures.

B. TREATMENT

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing

duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

C. CONDUIT CLEANING

As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

D. MULTIPLE CONDUITS

Separate multiple conduits by a minimum distance of 3 inches, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of 3 inches. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 10 feet of conduit assembly.

E. CONDUIT PLUGS AND PULL ROPE

Conduit indicated as being unused or empty shall be provided with plugs on each end. Plugs shall contain a weep hole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of all conduits.

F. CONDUIT AND DUCT WITHOUT CONCRETE ENCASEMENT

Provide not less than 3 inches clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles that would be retained on a 1/4 inch sieve. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 3 to 6 inch layers. Provide color, type and depth of warning tape as shown on the Drawings.

G. GROUNDING CONNECTIONS

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

1. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
2. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

H. GROUNDING CONDUCTORS

Provide bare grounding conductors, except where installed in conduit with associated phase conductors. Ground cable sheaths, cable shields, conduit, and equipment with No. 6 AWG. Ground other noncurrent-carrying metal parts and equipment frames of metal-enclosed equipment. Ground metallic frames and covers of handholes and pull boxes with a braided, copper ground strap with equivalent ampacity of No. 6 AWG. Provide direct connections to the grounding conductor with 600 v insulated, full-size conductor for each grounded neutral of each feeder circuit, which is spliced within the manhole.

3.5 EXCAVATING, BACKFILLING, AND COMPACTING

Provide in accordance with NFPA 70 and as indicated on the Drawings.

A. RECONDITIONING OF SURFACES

1. Unpaved Surfaces

Restore to their original elevation and condition unpaved surfaces disturbed during installation of duct or direct burial cable. Preserve sod and topsoil removed during excavation and reinstall after backfilling is completed. Replace sod that is damaged by sod of quality equal to that removed. When the surface is disturbed in a newly seeded area, re-seed the restored surface with the same quantity and formula of seed as that used in the original seeding, and provide topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

2. Paving Repairs

Where trenches, pits, or other excavations are made in existing roadways and other areas of pavement where surface treatment of any kind exists, restore such surface treatment or pavement the same thickness and in the same kind as previously existed, except as otherwise specified, and to match and tie into the adjacent and surrounding existing surfaces.

3.6 CAST-IN-PLACE CONCRETE

A. SEALING

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

B. FOLLOW-UP VERIFICATION

Upon completion of contracted work, the Contractor shall show by demonstration that all equipment, structural, earthwork, and below grade work has adequately been completed and installed.

APPENDIX A
GEOTECHNICAL REPORT



REPORT

25-1184 S

October 7, 2025

Explorations and Geotechnical Engineering Services

Proposed Substation
20 Fowlers Lane
Ipswich, Massachusetts

Prepared For:

RLC Engineering
Attention: David Longar
267 Whitten Road
Hallowell, ME 04347

Prepared By:

S. W. Cole Engineering, Inc.
13 Delta Drive, Unit 8
Londonderry, NH 03053
T: 603-716-2111

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TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 Scope and Purpose	1
1.2 Site and Proposed Construction	1
2.0 EXPLORATION AND TESTING	2
2.1 Explorations	2
2.2 Field Testing	2
2.3 Laboratory Testing	2
3.0 SUBSURFACE CONDITIONS	3
3.1 Soil and Bedrock	3
3.2 Groundwater	4
4.0 EVALUATION AND RECOMMENDATIONS	4
4.1 General Findings	4
4.2 Liquefaction Evaluations	5
4.3 Site and Subgrade Preparation	5
4.4 Excavation and Dewatering	6
4.5 Foundations	6
4.6 Corrosivity	7
4.7 Fill, Backfill and Compaction	7
4.8 Weather Considerations	8
4.9 Design Review and Construction Testing	8
5.0 CLOSURE	9
 Appendix A	Limitations
Appendix B	Figures
Appendix C	Exploration Logs & Key
Appendix D	Laboratory Test Results

25-1184 S

October 7, 2025

RLC Engineering
Attention: David Longar
267 Whitten Road
Hallowell, ME 04347

Subject: Explorations and Geotechnical Engineering Services
Proposed Substation
20 Fowlers Lane
Ipswich, Massachusetts

Dear David:

In accordance with our Proposal dated June 26, 2025, we have performed subsurface explorations for the subject project. This report summarizes our findings and geotechnical recommendations, and its contents are subject to the limitations set forth in Appendix A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to obtain subsurface information at the site in order to provide geotechnical recommendations for foundations and earthwork associated with the proposed construction. Our scope of services included test boring explorations, soils laboratory testing, a geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Site and Proposed Construction

The site is located at an existing substation south of Fowlers Lane across the road from a Wastewater Treatment Plant located at the east end of the road. Existing topography at the site appears to be relatively flat around elevation 49 feet with general topography in the area sloping downward from south to north. The ground surface within the fenced area is gravel.

We understand development plans call for construction of new spread footing foundations and structures within the existing fenced in area of the substation. Proposed site and grading plans are currently not available; however, we anticipate minimal grade changes in the substation area.

Proposed and existing site features are shown on the “Exploration Location Plan” attached in Appendix B.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Three test borings (B-1 through B-3) were made at the substation site on September 9 to 10, 2025, by Seaboard Drilling LLC working under subcontract to S. W. Cole Engineering, Inc. (S.W.COLE). Test boring B-4 was omitted from the scope due to accessibility restrictions. The exploration locations were selected by RLC Engineering and established in the field by S.W.COLE using measurements from existing site features. The approximate exploration locations are shown on the “Exploration Location Plan” attached in Appendix B.

Logs of the explorations and a key to the notes and symbols used on the logs are attached in Appendix C. The elevations shown on the logs were estimated based on topographic information provided by RLC Engineering.

2.2 Field Testing

The test borings were drilled using a combination of solid stem auger and cased wash-boring techniques. The soils were sampled at 2-to-10-foot intervals using a split spoon sampler and Standard Penetration Testing (SPT) methods. Pocket Penetrometer Tests (PPT) were performed where stiffer cohesive soils were encountered. Shelby tube sampling and Vane Shear Testing (VST) was performed selectively where softer cohesive soils were encountered. SPT blow counts, PPT and VST results are shown on the logs.

2.3 Laboratory Testing

Soil samples obtained from the explorations were returned to our laboratory for further classification and testing. One gradation, two Atterberg Limits and three moisture

content tests were performed. Atterberg Limits and moisture content results are noted on the logs and gradation test results are attached in Appendix D.

One composite sample was collected from test borings samples: B-2, 1D, 5 to 7 feet and B-3, 4D, 10 to 12 feet for corrosivity and resistivity testing. This composite sample was sent to Testing Services Analytical Laboratory for a suite of corrosivity laboratory tests (pH, sulfate, sulfide, soluble chloride, resistivity, and redox potential). The sample selected for laboratory testing is identified in the remarks area of the boring logs and the laboratory test results are attached in Appendix D.

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

One test boring (B-1) was performed on the south side of the existing substation and two test borings were performed on the north side of the existing substation. Not all the strata were encountered at each exploration; refer to the attached logs for more detailed subsurface information.

Test boring B-1 encountered a soils profile generally consisting of topsoil overlying layered deposits of loose to medium dense silt and fine sands to 5 feet over very dense sand and gravel to 10 feet over dense to very dense gravelly silty sand with occasional cobbles to 20.5 feet underlain by a medium dense to dense glacial till. The glacial till material consisted of gravelly sandy silty clay with occasional cobbles. The test boring was terminated at 30.4 feet within dense glacial till on a probable boulder or on bedrock.

In general, test borings B-2 and B-3 encountered a subsurface profile of topsoil overlying a loose uncontrolled fill and/or loose to medium dense fine sand and silt with varying percentages of clay to 10 feet over very stiff to medium stiff silty clay underlain by very dense glacial till. The glacial till material observed in B-2 consisted of clayey silty sand and gravel. One vane shear test was attempted in test boring B-2 at 20 feet, and the torque wrench reached its maximum value before the vane could turn, which confirms stiff in-situ soil conditions. A second vane shear test was performed in test boring B-3 at 32 feet and the soil had an undrained shear strength of 710 to 770 psf. Test boring B-2 was terminated at 47 feet in dense to very dense glacial till. Test boring B-3 was sampled to 34 feet and advanced through the silty clay layer by a rod probe to explore the depth of clay. The rod probe encountered refusal at 42.5 feet on a dense layer of probable glacial till.

3.2 Groundwater

At the time of drilling, groundwater in the form of wet soils was encountered in the two test borings north of the existing substation (B-2 and B-3) at 10 and 15 feet below the ground surface (El. 87 and 88 feet). South of the substation in test boring B-1, perched groundwater was observed at 17 to 20 feet below the ground surface (El. 80 to 83 feet). Long-term groundwater information is not available. It should be anticipated that groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings, it is our opinion that the proposed construction appears feasible from a geotechnical standpoint. The principal geotechnical considerations include:

- Based on the subsurface findings the soils present at footing elevations may consist of loose to medium dense silts and fine sands over dense sand and gravel or medium stiff clay underlain by dense glacial till. Groundwater was encountered in all test borings (B-2 and B-3) north of the existing substation at depths of 10 and 15 feet (El. 87 and 88 feet) and at B-1 south of the existing substation at 17 to 20 feet (El. 80 to 83 feet).
- Spread footing foundations bearing on properly prepared subgrades appear suitable for the proposed structures. Footings should bear on at least 12-inches of compacted Crushed Stone wrapped in a non-woven geotextile filter fabric overlying undisturbed native soils.
- The design frost depth for the Ipswich, Massachusetts area is 4.0 feet. Footings exposed to freezing temperatures (i.e. perimeter footings) must have at least 4.0 feet of soil cover to provide frost protection.
- Excavations will encounter fill material and native silt and sand soils. Earthwork and foundation construction activities should occur during drier, non-freezing weather of Spring, Summer and Fall. We recommend that footings be excavated using a smooth-edged bucket and that footings be underlain by at least 12-inches of Crushed Stone overlying undisturbed native soils. If winter construction does occur, the contractor must be prepared to undertake temporary frost protection

measures and systematically use materials that are more conducive to use in freezing temperatures.

- Due to the differing subsurface conditions observed on each side of the substation and the variation that is likely to exist within the substation area, S.W.COLE should be present to observe footing subgrades and provide recommendations relative to observed conditions.

4.2 Liquefaction Evaluations

Liquefaction can result in loss of foundation support and settlement that could adversely damage the building. Based on the subsurface findings and our analysis, the native soils are not susceptible to liquefaction during seismically induced ground motion from an earthquake or like event such as blasting or intense vibration.

4.3 Site and Subgrade Preparation

We recommend that site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. Surficial organics, roots and topsoil and all fill soils should be completely removed from areas of proposed fill and construction. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

Explorations outside the area of proposed construction did not encounter significant depths of uncontrolled fills, however we anticipate within the substation uncontrolled fills may exist to depths greater than observed in explorations. All uncontrolled fills, organic material, relic structures, foundations and debris must be completely removed from beneath the proposed construction, if encountered. The extent of removal should extend 1 foot laterally outward from outside edge of the slab area for every 1-foot of excavation depth (1H:1V bearing splay). The over-excavated area should be backfilled with compacted Structural Fill.

We recommend that footings be excavated using a smooth-edged bucket and that footings be underlain by at least 12-inches of Crushed Stone overlying undisturbed native soils. S.W.COLE should be present to observe footing subgrades and provide recommendations relative to over-excavation and/or soft/yielding subgrades.

4.4 Excavation and Dewatering

Excavation work will generally encounter granular fill material, silt and sand soils. Care must be exercised during construction to limit disturbance of the bearing soils. Final cuts to subgrade should be performed with a smooth-edged bucket to help reduce strength loss from soil disturbance. Earthwork and foundation construction activities should occur during drier, non-freezing weather of Spring, Summer and Fall. If winter construction does occur, the contractor must be prepared to undertake temporary frost protection measures and systematically use materials that are more conducive to use in freezing temperatures.

Vibrations from construction should be controlled below threshold limits of 0.5 in/sec for structures, water supply wells and infrastructure within 500 feet of the project site. More restrictive vibration limits may be warranted in specific cases with sensitive equipment, historic structures or artifacts on-site or within close proximity.

Wet soils were observed in two test borings on the north side of the substation at depths of 10 and 15 feet below the existing ground surface and perched groundwater was present deeper on the south side. Groundwater is not anticipated to be present at planned excavation depths. The contractor must be prepared to perform dewatering to control runoff water from precipitation and snowmelt.

Excavations must be properly shored or sloped in accordance with OSHA Regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures, utilities and roadways. The design and planning of excavations, excavation support systems, and dewatering is the responsibility of the contractor.

4.5 Foundations

We recommend the proposed structures be supported on 12 inches of Crushed Stone wrapped in non-woven geotextile filter fabric (Mirafi 180N or equivalent) over properly prepared subgrades. We recommend the following geotechnical parameters for design consideration:

Geotechnical Parameters for Foundations	
Design Frost Depth (100-year AFI)	4.0 feet
Net Allowable Soil Bearing Pressure	2.0 ksf
Base Friction Factor	0.35
Total Unit Weight of Backfill (Structural Fill)	125 pcf
Internal Friction Angle of Backfill	30°
At-Rest Lateral Earth Pressure Coefficient	0.5
Internal Friction Angle of Backfill	30°
Seismic Soil Site Class (ASCE 7-16)	E
Estimated Total Settlement	Less than 1-inch
Differential Settlement	Less than ½-inch

4.6 Corrosivity

Considering the corrosivity test results, we interpret the “10-Point System” provided in the ANSI/AWWA C105/A21.5 standard the sample score to be about 9 points. This indicates that the soil samples from each location are considered non-corrosive to ductile iron and cast iron.

According to the Portland Cement Association (PCA) manual Design and Control of Concrete Mixtures, Type II cement is used when concrete is to be in an environment with “negligible” to “moderate” sulfate exposure (sulfate values between 0 and 1500 ppm). Sulfate content for the sample tested was less than 10 ppm, therefore Type II cement is applicable. According to ACI 318 the sulfate exposure class is S0.

4.7 Fill, Backfill and Compaction

We recommend the following fill and backfill materials:

Structural Fill: Backfill for foundations should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below:

Structural Fill	
Sieve Size	Percent Finer by Weight
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 6

In our opinion, MassDOT-SSHB, Division III, M1.03.0, Gravel Borrow Type B with less than 6 percent passing the #200 sieve meets requirements of Structural Fill.

Crushed Stone: Crushed Stone used beneath foundations should be clean, washed crushed stone meeting the requirements of MassDOT-SSHB, Division III, M2.01.4, ¾-inch Crushed Stone.

Reuse of Site Soils: The native non-organic silt and sand soils appear unsuitable for reuse as the backfill materials described above.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in structure areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Crushed Stone should be compacted with 3 to 5 passes of a vibratory plate compactor having a static weight of at least 500 pounds.

4.8 Weather Considerations

Construction activity should be limited during wet and freezing weather and the site soils may require drying or thawing before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

4.9 Design Review and Construction Testing

S.W.COLE should be retained to review the construction documents prior to bidding to determine that our earthwork and foundation recommendations have been properly interpreted and implemented.

A construction materials testing and quality assurance program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to observe earthwork activities, the preparation of foundation bearing surfaces, as well as to provide testing and IBC Special Inspection services for soils and concrete construction materials.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

S. W. Cole Engineering, Inc.

Courtney W. Mattson, P.E.
Senior Geotechnical Engineer



CWM:rec

APPENDIX A

Limitations

This report has been prepared for the exclusive use of the RLC Engineering for specific application to the Proposed Substation at 20 Fowlers Lane in Ipswich, Massachusetts. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

APPENDIX B

Figures

R:\2025\25-1184\AcProject\25-1184.aprx, 9/17/2025 1:34 PM 25-1184 Sheet 1 - ELP, Scale: 1:480, CMORRISON, S. W. COLE ENGINEERING, INC.



MassGIS, Massachusetts Department of Transportation (MassDOT), MassGIS

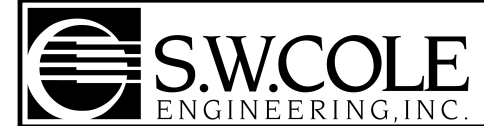


LEGEND

 APPROXIMATE BORING LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN PREPARED FROM ORTHOIMAGERY TITLED "MASSACHUSETTS 2023 AERIAL IMAGERY," PROVIDED BY MASSGIS.
2. THE BORINGS WERE LOCATED IN THE FIELD BY S. W. COLE ENGINEERING, INC. USING A RECREATIONAL GRADE GPS RECEIVER.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.



RLC ENGINEERING
EXPLORATION LOCATION PLAN
 PROPOSED SUBSTATION
 20 FOWLERS LANE
 IPSWICH, MASSACHUSETTS

Job No.	25-1184	Scale	1" = 40'
Date:	09/17/2025	Sheet	1

APPENDIX C

Exploration Logs and Key



BORING LOG

BORING NO.: B-1
SHEET: 1 of 2
PROJECT NO.: 25-1184
DATE START: 9/9/2025
DATE FINISH: 9/9/2025

CLIENT: RLC Engineering
PROJECT: Proposed Substation
LOCATION: 20 Fowlers Lane, Ipswich, Massachusetts

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 100' Estimated **TOTAL DEPTH (FT):** 30.4 **LOGGED BY:** Bryce Walker
DRILLING CO.: Seaboard Drilling **DRILLER:** Matt Bussey **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-48 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic / N/A **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A / N/A **CORE BARREL:** N/A
HAMMER CORRECTION FACTOR: 1.51 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Water appears perched 17 to 20 feet
GENERAL NOTES: Southwest of existing substation

KEY TO NOTES AND SYMBOLS:
 Water Level
 At time of Drilling
 At Completion of Drilling
 After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks	
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD					Field / Lab Test Data
			1D		0-2	24/19	3-3-4-4		0.2	2" Topsoil		
			2D		2-4	24/18	4-5-8-8		1.5	Moist, loose, light brown to orange, SILT and fine SAND with rootlets Moist, loose, tan to light brown, silty fine SAND		
95	5		3D		5-7	24/16	21-44-41-40		3.0	Moist, loose to medium dense, light brown to gray, sandy SILT trace gravel with rootlets to 4 feet		
90	10		4D		10-10.6	7/7	35-50/1"		5.0	Moist, very dense, brown to gray, SAND and GRAVEL some silt frequent cobbles		
85	15		5D		15-17	24/1	17-21-22-20		10.0	Moist to saturated, dense to very dense, brown to gray, gravelly silty SAND occasional cobbles		
80	20		6D		20-22	24/20	11-12-13-15		20.5	Moist, medium dense to dense, gray, gravelly sandy silty CLAY occasional cobbles below 25 feet (Till)		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

(Continued Next Page)

BORING NO.: B-1



BORING LOG

BORING NO.: B-1
SHEET: 2 of 2
PROJECT NO.: 25-1184
DATE START: 9/9/2025
DATE FINISH: 9/9/2025

CLIENT: RLC Engineering
PROJECT: Proposed Substation
LOCATION: 20 Fowlers Lane, Ipswich, Massachusetts

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
			7D		25-27	24/22	9-12-17-20		Moist, medium dense to dense, gray, gravelly sandy silty CLAY occasional cobbles below 25 feet (Till)		
70	30		8D	⊗	30-30.4	5/5	50/5"				

Auger Refusal at 30.4 feet
Probable Boulder or Bedrock

BORING / WELL 10-12-2022 25-1184.GPJ SWCE TEMPLATE.GDT 9/24/25

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-1**



BORING LOG

BORING NO.: B-2
SHEET: 1 of 2
PROJECT NO.: 25-1184
DATE START: 9/9/2025
DATE FINISH: 9/10/2025

CLIENT: RLC Engineering
PROJECT: Proposed Substation
LOCATION: 20 Fowlers Lane, Ipswich, Massachusetts

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 98' Estimated **TOTAL DEPTH (FT):** 49.0 **LOGGED BY:** Bryce Walker
DRILLING CO.: Seaboard Drilling **DRILLER:** Matt Bussey **DRILLING METHOD:** Cased Boring
RIG TYPE: Track Mounted Mobile Drill B-48 **AUGER ID/OD:** N/A / N/A **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic / Automatic **HAMMER WEIGHT (lbs):** 140 / 140 **CASING ID/OD:** 4 in / 4 1/2 in **CORE BARREL:** N/A
HAMMER CORRECTION FACTOR: 1.51 **HAMMER DROP (inch):** 30 / 30

WATER LEVEL DEPTHS (ft): Soils appear wet below 10 feet; water introduced to drilling at 15 feet.

GENERAL NOTES: Northwest of existing substation on west side of access drive

KEY TO NOTES AND SYMBOLS:
Water Level D = Split Spoon Sample Pen. = Penetration Length WOR = Weight of Rods S_v = Field Vane Shear Strength, kips/sq.ft.
▽ At time of Drilling U = Thin Walled Tube Sample Rec. = Recovery Length WOH = Weight of Hammer q_u = Unconfined Compressive Strength, kips/sq.ft.
▼ At Completion of Drilling R = Rock Core Sample bpf = Blows per Foot RQD = Rock Quality Designation Ø = Friction Angle (Estimated)
▼ After Drilling V = Field Vane Shear mpf = Minute per Foot PID = Photoionization Detector N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
			1D		0-2	24/13	2-3-4-5		0.2	2" Topsoil	
			2D		2-4	24/19	4-6-6-6	ID 9692M w =25.6 %	2.0	Moist, loose, brown to orange, silty SAND some gravel with rootlets	
	5		3D		5-7	24/24	3-2-3-4	q _p =2.0-3.0 ksf	5.0	Moist, medium dense, tan to light brown, SILT and fine SAND	3D sample selected for corrosivity lab testing
	10		4D		10-12	24/24	WOH/12"-2-2	q _p =1.5-2.0 ksf ID 9693M w =34.6 % W _L =45 W _p =22	10.0	Moist, very stiff to medium stiff, gray to light brown, clayey SILT trace fine sand	
	15		5D		15-17	24/24	WOH/18"-2			Wet, stiff to medium stiff, gray, CLAY some to silty (occasional to frequent silt seams)	Switched from 4 1/2" SSA to 4" casing at 15 feet
	20		1U		20-22	24/24					
	25		1V		22-22.5	6		S _v =1.09+ksf			1V: Vane inserted and did not turn

BORING / WELL 10-12-2022 25-1184.GPJ SWCE TEMPLATE.GDT 9/24/25

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

(Continued Next Page)

BORING NO.: **B-2**



BORING LOG

BORING NO.: B-2
SHEET: 2 of 2
PROJECT NO.: 25-1184
DATE START: 9/9/2025
DATE FINISH: 9/10/2025

CLIENT: RLC Engineering
PROJECT: Proposed Substation
LOCATION: 20 Fowlers Lane, Ipswich, Massachusetts

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
			6D		25-27	24/24	WOH/18"-2		Wet, stiff to medium stiff, gray, CLAY some to silty (occasional to frequent silt seams)		
	30		7D		30-32	24/24	WOH/18"-3				
	65		8D		35-37	24/24	WOH/12"-1-3				
	40		9D		40-42	24/24	WOH/12"-4-3				
	55							43.0 Probable SAND and GRAVEL layer		Observed in drill action/spoils	
	45		10D		45-47	24/24	3-1-3-4	44.5 Wet, soft, gray, CLAY some to silty some gravel trace sand			
	50		11D		47-49	24/6	11-27-25-55	47.0 Wet, very dense, gray, clayey silty SAND and GRAVEL (Till)			

Bottom of Exploration at 49.0 feet

BORING / WELL 10-12-2022 25-1184.GPJ SWCE TEMPLATE.GDT 9/24/25

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-2**



BORING LOG

BORING NO.: B-3
SHEET: 1 of 2
PROJECT NO.: 25-1184
DATE START: 9/10/2025
DATE FINISH: 9/10/2025

CLIENT: RLC Engineering
PROJECT: Proposed Substation
LOCATION: 20 Fowlers Lane, Ipswich, Massachusetts

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 102' Estimated **TOTAL DEPTH (FT):** 42.6 **LOGGED BY:** Bryce Walker
DRILLING CO.: Seaboard Drilling **DRILLER:** Matt Bussey **DRILLING METHOD:** Cased Boring
RIG TYPE: Track Mounted Mobile Drill B-48 **AUGER ID/OD:** N/A / N/A **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic / Automatic **HAMMER WEIGHT (lbs):** 140 / 140 **CASING ID/OD:** 4 in / 4 1/2 in **CORE BARREL:** N/A
HAMMER CORRECTION FACTOR: 1.51 **HAMMER DROP (inch):** 30 / 30
WATER LEVEL DEPTHS (ft): Soils appear wet below 15 feet; water introduced to drilling at 25 feet

GENERAL NOTES: North of existing substation on east side of access drive

KEY TO NOTES AND SYMBOLS:
 Water Level: ▽ At time of Drilling D = Split Spoon Sample Pen. = Penetration Length WOR = Weight of Rods S_v = Field Vane Shear Strength, kips/sq.ft.
▽ At Completion of Drilling U = Thin Walled Tube Sample Rec. = Recovery Length WOH = Weight of Hammer q_u = Unconfined Compressive Strength, kips/sq.ft.
▽ After Drilling R = Rock Core Sample bpf = Blows per Foot RQD = Rock Quality Designation Ø = Friction Angle (Estimated)
 V = Field Vane Shear mpf = Minute per Foot PID = Photoionization Detector N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
			1D		0-2	24/18	4-6-6-7		0.3 3" Grassed Topsoil		
			2D		2-4	24/17	7-9-10-8		1.0 Moist, loose, dark brown, sandy gravelly SILT with rootlets (Fill)		
	5		3D		5-7	24/24	7-9-10-9		Damp to moist, medium dense, tan to light brown, fine SAND silty to trace silt to silty (frequent SILT seams with depth)		
	10		4D		10-12	24/24	2-3-4-6	q _p =4.0-5.5 ksf	10.0 Moist to wet, very stiff to medium stiff, gray, CLAY some silt to silty (occasional to frequent silt seams)		4D sample selected for corrosivity lab testing
	15		5D		15-17	24/24	WOH/6" 2-3-2	q _p =1.0-3.0 ksf			
	20		6D		20-22	24/24	WOH/18" 3	ID 9694M w =38.6 % W _L =55 W _p =24			

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

(Continued Next Page)

BORING NO.: B-3



BORING LOG

BORING NO.: B-3
SHEET: 2 of 2
PROJECT NO.: 25-1184
DATE START: 9/10/2025
DATE FINISH: 9/10/2025

CLIENT: RLC Engineering
PROJECT: Proposed Substation
LOCATION: 20 Fowlers Lane, Ipswich, Massachusetts

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
75											
	30		1U		30-32	24/24					
70			1V		32-32.5	6		S _v =0.71/0.03ksf			
			1V'		33-33.5	6		S _v =0.77/0.03ksf			
	35										
	65										
	40										
	60										

42.5 Probable clayey silty SAND and GRAVEL (Till)
 Probe Refusal at 42.5 feet (Probable Dense Till)

ROD PROBE
Depth Resistance Interpreted Soil Type
 34-42.5 HYD Some-Silty Clay

Stiff to medium stiff, gray, CLAY silty to some silt (occasional to frequent silt seams)

Switched from 2 1/4" HSA to 4" casing at 25 feet

BORING / WELL 10-12-2022 25-1184.GPJ SWCE TEMPLATE.GDT 9/24/25

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-3**

KEY TO NOTES & SYMBOLS
Test Boring and Test Pit Explorations

Stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q _u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S _v	-	field vane shear strength, kips/sq. ft.
L _v	-	lab vane shear strength, kips/sq. ft.
q _p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W _L	-	liquid limit - Atterberg test
W _P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ _T	-	total soil weight
γ _B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
“Y”	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16” thickness
Seam:	1/16” to 1/2” thickness
Layer:	1/2” to 12” thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: Test Boring Explorations - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: Test Pit Explorations - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

APPENDIX D

Laboratory Test Results



Report of Gradation

ASTM C-117 & C-136

Project Name IPSWICH MA - 20 FOWLER LANE SUBSTATION - GEOTECHNICAL
ENGINEERING SERVICES

Project Number 25-1184

Client RLC ENGINEERING, LLC

Lab ID 9692M

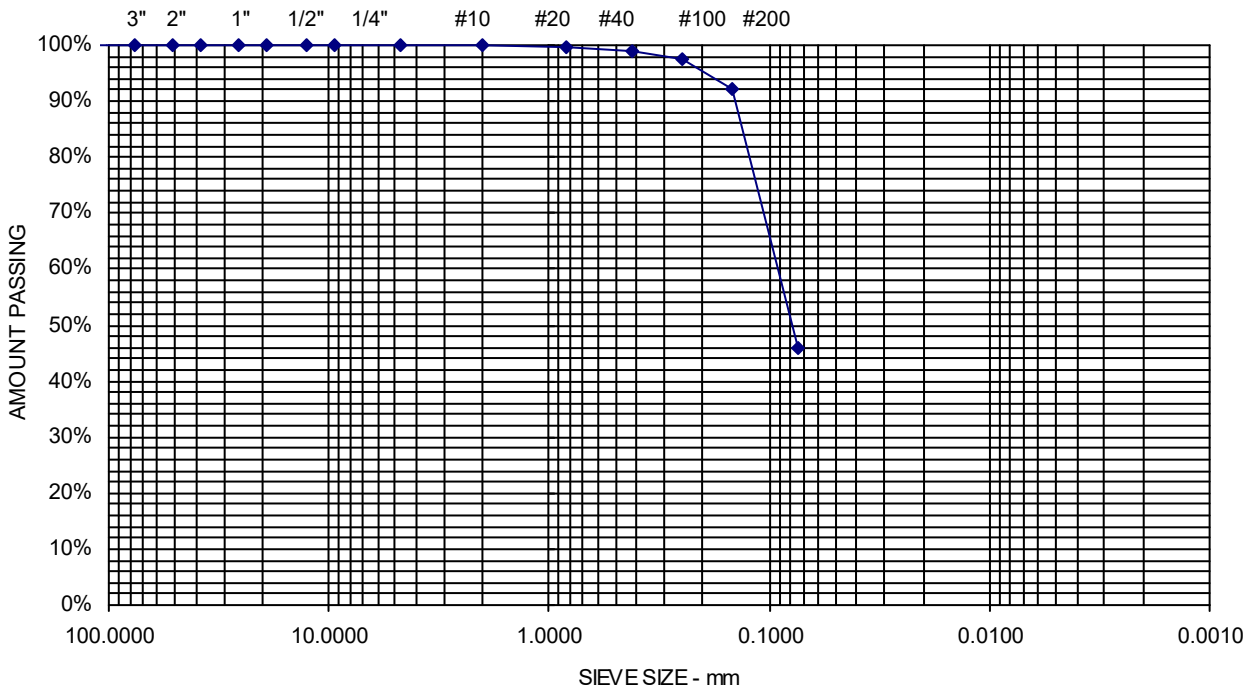
Date Received 9/16/2025

Date Completed 9/22/2025

Material Source B-2, 2D, 2-4'

Tested By ELIZABETH HALSTEAD

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
150 mm	6"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	100	
19.0 mm	3/4"	100	
12.5 mm	1/2"	100	
9.5 mm	3/8"	100	
4.75 mm	No. 4	100	0% Gravel
2.00 mm	No. 10	100	
850 μm	No. 20	99	
425 μm	No. 40	99	54.2% Sand
250 μm	No. 60	97	
150 μm	No. 100	92	
75 μm	No. 200	45.8	45.8% Fines



Comments: As-Received Moisture Content - 25.6%



Report of Atterberg Limits

ASTM D4318-10 - Method A

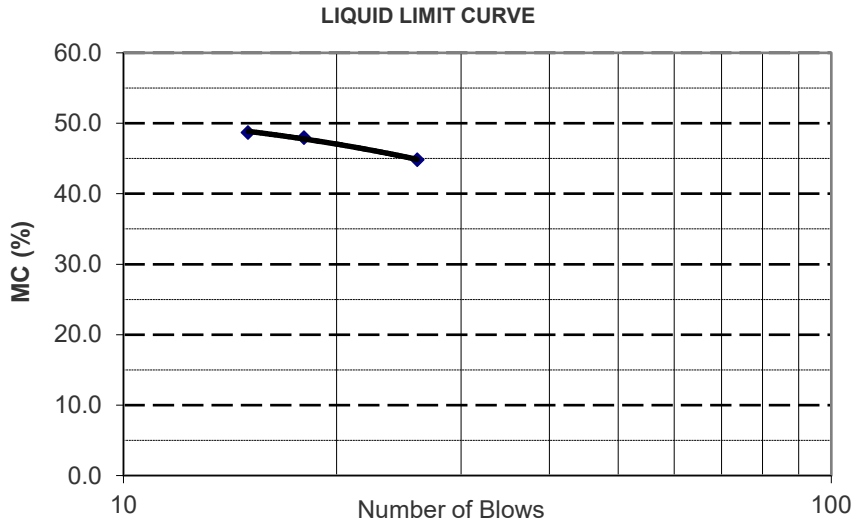
Project Name: Proposed Substation
Project Location: Ipswich, MA
Client: RLC Engineering
Material Description: Boring Sample
Material Source: B-2, 4D, 10-12'

Project Number: 25-1184
Lab ID: 9693M
Date Received: 09/10/25
Date Completed: 09/23/25
Tested By: D. Jack

Liquid Limit 45

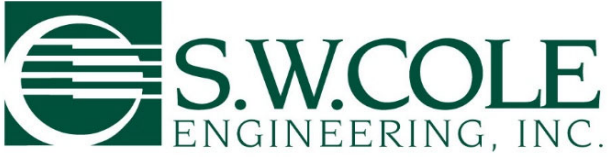
Plastic Limit 22

Plasticity Index 23



Material Retained On the No. 40 Sieve: 0%

As-received Moisture Content: 34.6%



Report of Atterberg Limits

ASTM D4318-10 - Method A

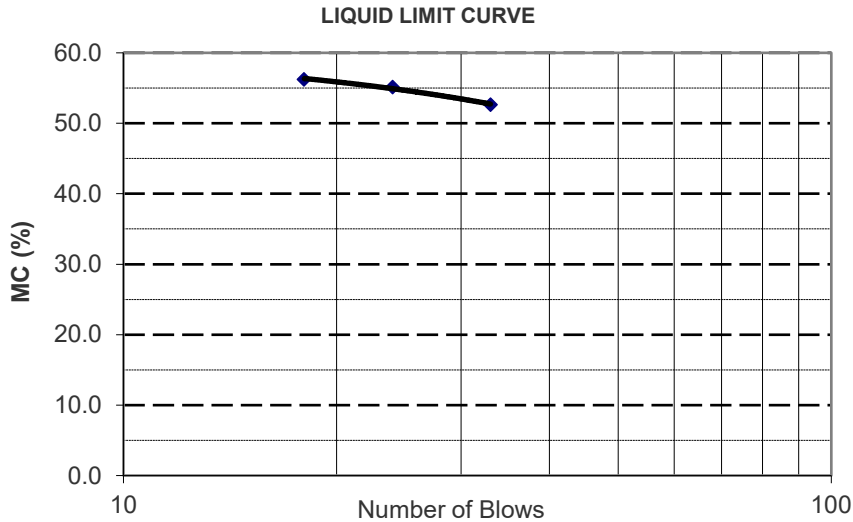
Project Name: Proposed Substation
Project Location: Ipswich, MA
Client: RLC Engineering
Material Description: Boring Sample
Material Source: B-3, 6D, 20-22'

Project Number: 25-1184
Lab ID: 9694M
Date Received: 09/10/25
Date Completed: 09/23/25
Tested By: D. Jack

Liquid Limit **55**

Plastic Limit **24**

Plasticity Index **31**



Material Retained On the No. 40 Sieve: 2.3%

As-received Moisture Content: 38.6%



SW COLE ENGINEERING INCORPORATED
 13 DELTA DRIVE
 UNIT 8
 LONDONDERRY NH 03053-2372
 USA

Analysis No. TS-A2513124
 Report Date 29 September 2025
 Date Sampled 17 September 2025
 Date Received 25 September 2025
 Where Sampled Londonderry, NH USA
 Sampled By Client

This is to attest that we have examined: Soils, Project: Proposed Substation; Site Location: 20 Fowler Lane, Ipswich, MA; Job Number: 25-1184

When examined to the applicable requirements of:

- ASTM D 1411-09* "Standard Test Methods for Water-Soluble Chlorides Present as Admixtures in Graded Aggregate Road Mixes" Method A
- ASTM D 516-16 "Standard Test Method for Sulfate Ion in Water"
- ASTM D 4658-15 "Standard Test Method for Sulfide Ion in Water"
- ASTM G 51-18 "Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing"
- ASTM G 200-20 "Standard Test Method for Measurement of Oxidation-Reduction Potential (ORP) of Soil"
- ASTM G 187-18 "Standard Test Method for Measurement of Soil Resistivity Using the Two-Electrode Soil Box Method" (Saturated)

Results:

ASTM D 1411 – Chloride Method A

Sample	Results		Minimum Detection Limit
	ppm (mg/kg)	% ¹	
Composite of: B-2, 1D, 5-7' and B-3, 1D, 10-12'	35.	0.0035	10.

NOTE: ¹Percent by weight after drying and prepared as per the Standard. *Withdrawn 2018 No Replacement.

ASTM D 516 – Sulfates (Soluble)

Sample	Results		Minimum Detection Limit
	ppm (mg/kg)	% ¹	
Composite of: B-2, 1D, 5-7' and B-3, 1D, 10-12'	< 10.	< 0.0010	10.

NOTE: ¹Percent by weight after drying and prepared as per the Standard.

CERTIFICATE OF ANALYSIS

ASTM D 4658 – Sulfide

Sample	Results		Minimum Detection Limit
	ppb (µg/kg)	% ¹	
Composite of:	12 040.	0.0012040	10.
B-2, 1D, 5-7' and B-3, 1D, 10-12'			

NOTE: ¹Percent by weight after drying and prepared as per the Standard.

ASTM G 51 – pH

Sample	Results	Minimum Detection Limit
Composite of:	5.54	0.01
B-2, 1D, 5-7' and B-3, 1D, 10-12'		

NOTE: Prepared as per the Standard.

ASTM G 200 – Reduction Oxidation Potential (REDOX)

Sample	Results	Minimum Detection Limit
Composite of:	89.4 @ 23.5 °C	0.1mV
B-2, 1D, 5-7' and B-3, 1D, 10-12'		

NOTE: Prepared as per the Standard.

ASTM G 187 – Resistivity (Saturated using Soil Box)

Sample	Results	
	ohms-cm	mho/cm
Composite of:	4 000	0.000248
B-2, 1D, 5-7' and B-3, 1D, 10-12'		

NOTE: Prepared as per the Standard.

END OF ANALYSIS

USEPA Laboratory ID UT00930



Merrill Gee P.E. – Engineer in Charge

IPSWICH ELECTRIC LIGHT DEPARTMENT

SUBSTATION YARD UPGRADES

ADDENDA #1

Ipswich Electric Light Department is altering the scope of the Fowlers Lane Substation Upgrades to include the removal and replacement of the existing single-phase hook stick operable disconnect switches. The attached removal and additions drawings detail the additional equipment isolation switches to be replaced.

During the Substation Yard Upgrades, the substation will be de-energized. This presents IELD an opportunity to replace the existing aged switches with new replacements. Switch replacements will be a one-to-one replacement. It is expected that the existing cable taps and connectors will be adequate to reuse on the new switches.

IELD wishes to replace these disconnects with a Siemens hookstick operable disconnect; catalog #640CTX (thirty (30) switches total) for the 15kV buses and catalog #740CTX (six (6) switches total) for the 23kV buses. Ipswich will provide the equipment for this project as assigned in the BOM. This scope change is not reflected in the main body of this bid. This change is not reflected in the engineering documents developed by RLC Engineering. The switch quantity is in addition to the quantity listed in the BOM.

Bidders will provide unit cost for the replacement of a disconnect switch. This cost must be included to qualify as an acceptable bid. Please enter your bid price below:

The switches are Seimens disconnects, Hookstick operable, Type EH Disconnect Switch, with Polymer Insulators.

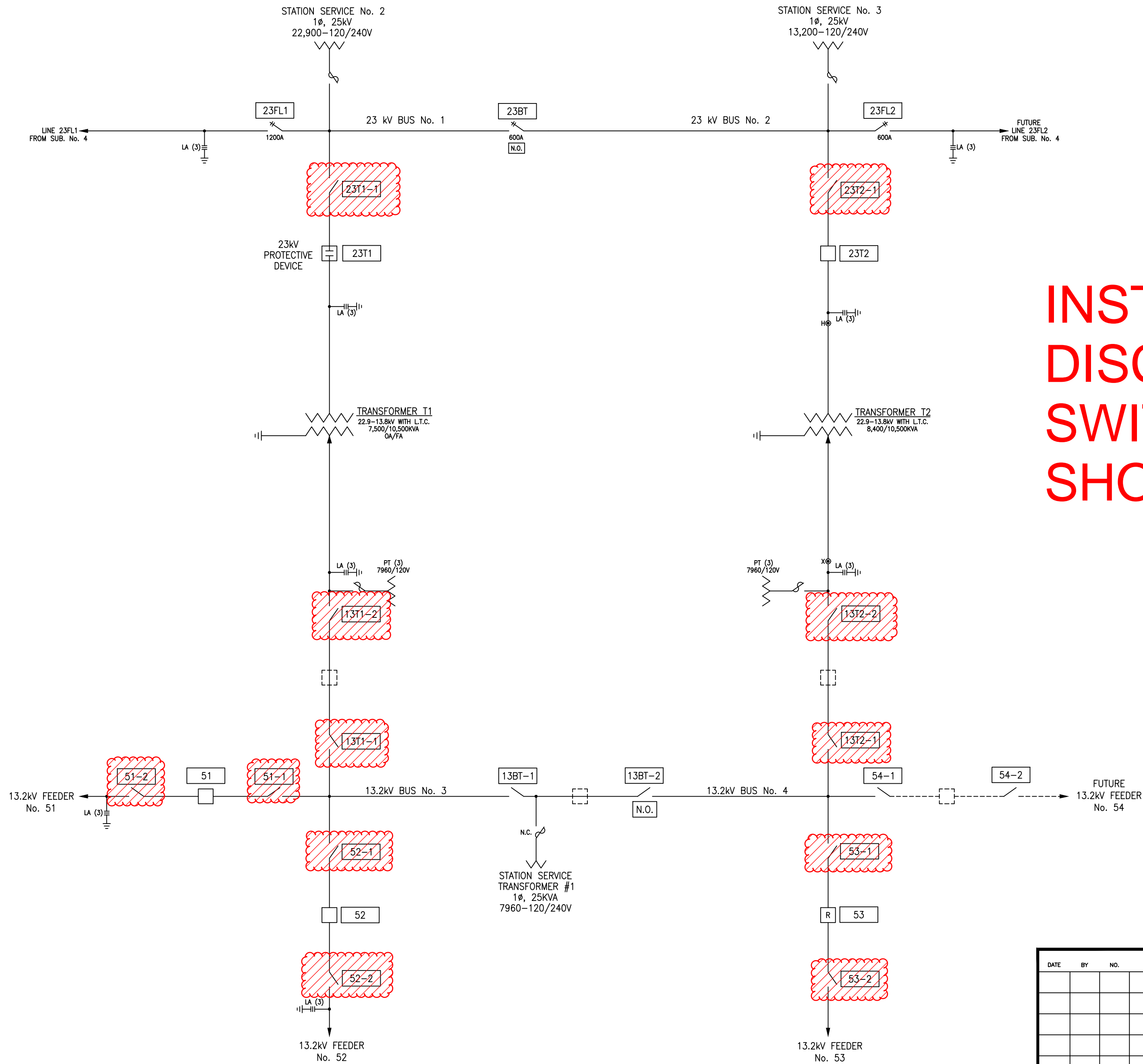
15kV Disconnects are Catalog #640CTX.

23kV Disconnects are Catalog #740CTX.

Section	Description	Qty	Unit Price	Total Price
1.10.1	Installation of 15kV Manually Operated Hook stick Switch	30		
1.10.2	Installation of 23kV Manually Operated Hook stick Switch	6		
1.10.3	Labor to replace switch taps if needed. IELD shall provide material			

It is anticipated that the existing switch taps can be re-used. Please provide a unit price for instances where the tap needs replacement. Tap replacement requires IELD approval.

FOWLERS LANE: SUBSTATION YARD UPGRADES
ADDENDA #1

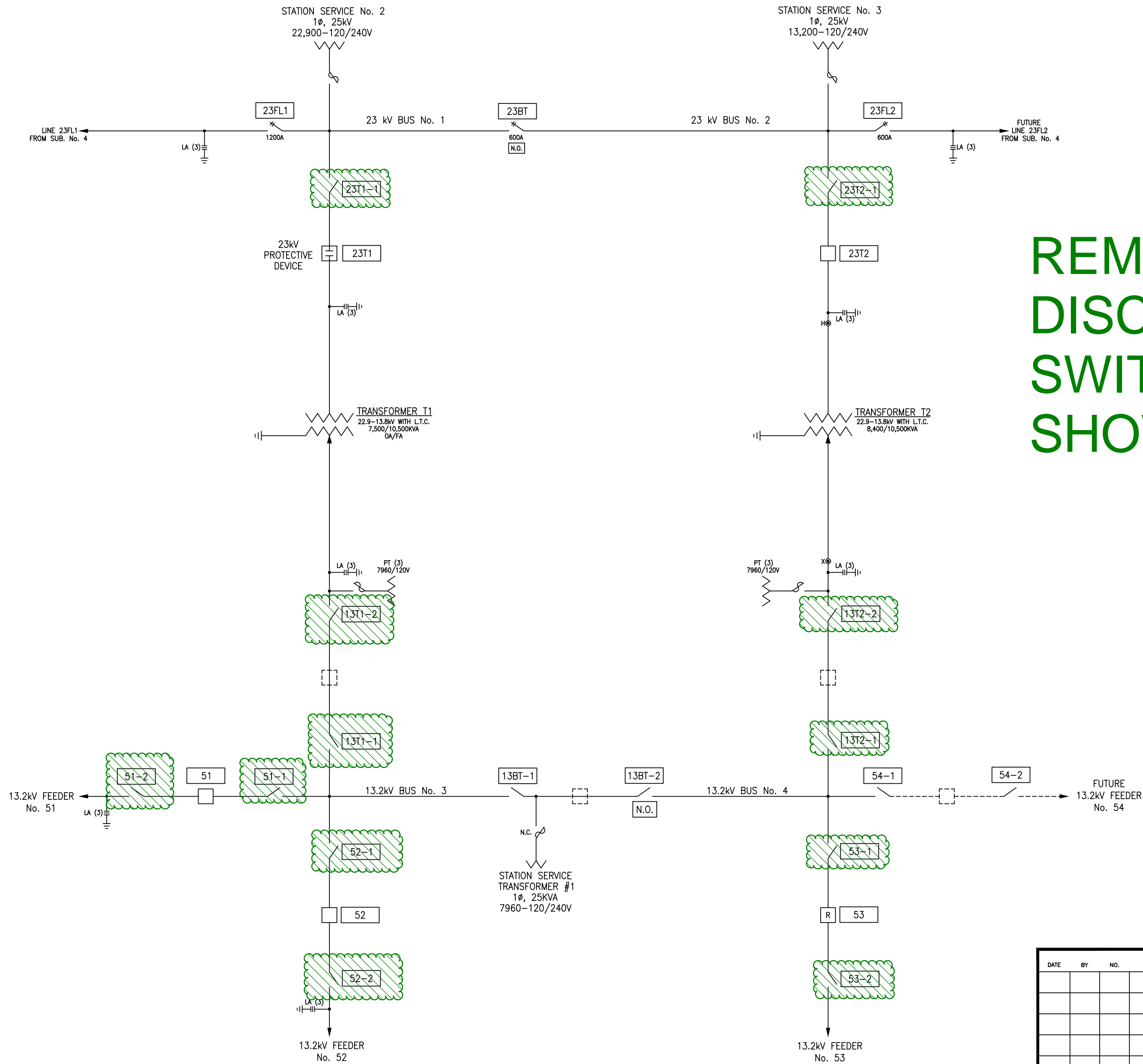


**INSTALL
DISCONNECT
SWITCHES AS
SHOWN**

REVISIONS			
DATE	BY	NO.	

PLM	ELECTRIC POWER ENGINEERING	
	35 MAIN STREET (508) 435-0200 HOPKINTON, MA 01748	
	IPSWICH MUNICIPAL LIGHT DEPARTMENT IPSWICH, MASSACHUSETTS	
	FOWLERS LANE SUBSTATION No. 5	
ONE LINE DIAGRAM DEVICE DESIGNATIONS		DATE
		SCALE
		NO.
DRAWN	GJP	
CKD		
APPD		
DATE	10/12/01	
SCALE	NONE	
NO.	919506-E202-0	

FOWLERS LANE: SUBSTATION YARD UPGRADES
ADDENDA #1



REMOVE
DISCONNECT
SWITCHES AS
SHOWN

REVISIONS			
DATE	BY	NO.	

PLM DRAWN: GJP CKD: APPD: DATE: 10/12/01 SCALE: NONE	ELECTRIC POWER ENGINEERING 35 MAIN STREET (508) 435-0200 HOPKINTON, MA 01748
	IPSWICH MUNICIPAL LIGHT DEPARTMENT IPSWICH, MASSACHUSETTS FOWLERS LANE SUBSTATION No. 5
	ONE LINE DIAGRAM DEVICE DESIGNATIONS
	NO. 919506-E202-0

SECTION E
AGREEMENT

THIS AGREEMENT, made this ___ day of _____,
2026, by and between the party of the first part, Ipswich Electric Light Department hereinafter called "OWNER," acting herein through its General Manager, and the party of the second part, _____ doing business as *(an individual) (a partnership) (a joint venture) (a corporation) located in the *(City) (Town) of _____, County of _____, and State of _____, hereinafter called "CONTRACTOR."

WHEREAS, Pursuant to M.G.L. c. 30, § 39M, Owner issued an Invitation for Bids ("IFB") for its "**Fowler's Lane #5 Substation Upgrade Project**", IFB July 8, 2026, as set forth in the Contract Documents ("Work");

WHEREAS, CONTRACTOR submitted a bid to perform the Work in accordance with the IFB July 8, 2026,

WHEREAS, OWNER determined that the CONTRACTOR qualifies as the lowest responsible and eligible bidder and voted to award the contract to such CONTRACTOR;

NOW THEREFORE, the parties do hereby mutually covenant and agree as follows:

1. The "Contract Documents" shall mean the entire IFB, including all completed and executed IFB forms and documents, and any written change order and/or modification signed by the parties.
2. The CONTRACTOR hereby agrees to commence the Work under this Contract on the date or timeframe to be specified in written "Notice to Proceed" issued by the Owner ("Commencement Date"). Completion on November 3 is expected. Liquidated damages of \$1000/day will be assessed for each day beyond the November 9 deadline.
3. The CONTRACTOR shall furnish all Work and perform all obligations in accordance with the terms and conditions, specifications and other requirements set forth in the Contract Documents.
4. The CONTRACTOR shall provide all labor, equipment, and materials necessary to perform the Work at the rates and charges set forth in Section C – Bid Form. The Contractor shall furnish all other materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, bonds, and other accessories and administrative and support services necessary to complete the Work at its expense, except where specifically excluded.
5. IELD shall pay the CONTRACTOR for such Work from current in accordance with the Contract Documents, subject to additions and deductions, as provided in Section H, Terms and Conditions.

6. The CONTRACTOR agrees not to discriminate against or exclude any person from participation herein on grounds of race, religion, color, sex, age or national origin.
7. The CONTRACTOR agrees not to participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1954, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.
8. For purposes of this Agreement, the Warranty Period for the services shall be one (1) year from the date of completion of the project. For reperformance of non-conforming or defective work, the Warranty Period shall continue for the greater of the remaining term of the Warranty Period or 90 days/months beginning on the day reperformance of the defect is completed. (See General Terms and Conditions, Section H).

IN WITNESS WHEREOF, the parties to these presents have executed this contract in four (4) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

Ipswich Electric Light Department
(Owner)

By _____

(Name)

(Title)

(Contractor)

By _____

(Name)

(Title)

(Address)

SECTION F

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ a _____
(Name of Contractor) (Corporation, Partnership, Joint Venture or Individual)

hereinafter called "Principal" and _____
(Surety)

of _____, State of _____ hereinafter
(City and State)

called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Ipswich Electric Light Department, hereinafter called "Owner" or "IELD", in the penal sum of _____

_____ Dollars

(\$ _____) in lawful money of the United States, 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 entered into a certain contract with IELD, dated the _____ day of _____, 20____, a copy of which is hereto attached and made a part hereof for the construction described as follows:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between IELD and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20__.

ATTEST:

Principal

By _____
(Principal Secretary)

(Address-Zip Code)

(SEAL)
Witness as to Principal

(Address-Zip Code)

ATTEST:

Surety

By _____
(Attorney-in-Fact)

(Address-Zip Code)

(SEAL)
Witness as to Surety

(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

SECTION G

INSURANCE REQUIREMENTS

GENERAL REQUIREMENTS

The Contractor shall comply with the following insurance requirements and coverages.

Coverages listed are minimum requirements.

Contractor shall provide a certificate of insurance naming the Ipswich Electric Light Department (“IELD”) and the Town of Ipswich (“Town”) as “Additional Insureds” in accordance with all requirements of the bid documents within ten (10) days of receiving notice of the contract award or upon execution of the Agreement. (See further details below.)

Contractor’s liability coverage shall be endorsed naming IELD and the Town as “**Additional Insureds**” and certificate(s) for the same shall be indicated on their face by the words: “Ipswich Electric Light Department and the Town of Ipswich are named as Additional Insureds AND by checking off the appropriate box on the Acord Form. Such policies shall also be endorsed to contain waivers of insurer’s subrogation rights against IELD by including the following language or similar language on the certificate: “The Contractor waives its right of subrogation against and in favor of IELD and the Town, as Additional Insureds, which may arise by reason of payment of a claim under the policy.” Contractor shall indemnify and hold IELD harmless for failure to effect such waiver(s). Certificates utilizing the ACORD form shall also clearly evidence in the blank “Description of Operations” or “other” block that “Contractual Liability Coverage is included in the General Liability coverage and has not been excluded,” or words that mean or have similar effect.

IELD reserves the right to obtain copies of applicable policies for examination upon request at reasonable times. The required coverage shall be primary to any other coverage available to IELD and shall not be deemed to limit Contractor’s liability under this Agreement. Contractor shall be liable for all deductible amounts from such insurance and shall hold IELD harmless therefrom. Insurance shall not be cancelled, terminated, reduced or materially changed without at least thirty (30) days prior written notice to IELD. Such notices shall be provided as specified in the Agreement. Failure of Contractor or any of its subcontractors or assigns or any other party for which it is legally responsible, to maintain required coverage shall not relieve any of them of any responsibility, obligation or liability arising out of the Agreement. Coverage shall remain effective for a period of two (2) years after termination of the Agreement for any reason.

Nothing contained in this provisions is to be construed as limiting the extent of Contractor’s obligations to indemnify and hold IELD harmless as set forth in the Contract Documents.

CERTIFICATION OF
INSURANCE COVERAGE

All insurance required hereunder shall be provided on policy forms, in companies and through agencies satisfactory to IELD.

The Contractor shall provide annually a Certificate of Insurance as evidence of such insurance. It is further agreed that the Contractor shall provide IELD a thirty (30) day written notice of cancellation and/or non-renewal. It is also agreed that either the Contractor or IELD may invoke the tail option on behalf of the other party and that any extended reporting period (ERP) shall be paid by the Contractor.

The Contractor shall not cause any insurance policy to be canceled, permit any policy to lapse or reduce the amount of such insurance during the period of the contract. All insurance policies shall include a provision to the effect that the insurance policy shall not be subject to cancellation, lapse, or to a reduction in the amount of insurance until written notice has been delivered to IELD by the insuring company stating the date that such cancellation, lapse or reduction shall be effective, which date shall be not less than thirty (30) days after the delivery of such notice.

Within ten (10) days after notification of the contract award, the Contractor shall file with IELD certificates from its insurance companies certifying to the coverage of all insurance required herein and if asked by IELD, the Contractor shall furnish copies of all insurance policies and/or applicable endorsements.

All certificates of insurance shall be authenticated by the proper officer of the insured and shall certify the names of those insured, the type and amount of the insurance, the location and operations to which the insurance applies, the expiration date, and that the insuring company will give written notice to IELD of at least thirty (30) days prior to the effective date of any cancellation, lapse, or reduction in limits.

LIABILITY INSURANCE

Personal injury: The Contractor shall purchase and maintain commercial general liability insurance covering personal injuries or death suffered or alleged to have been suffered by any person or persons by reason of or in the course of operations under the contract, whether occurring by reason of acts or omissions of the Contractor or any subcontractor or anyone directly or indirectly employed by them.

Property damage: The Contractor shall purchase and maintain commercial general liability insurance covering damages to property suffered or alleged to have been suffered by any person or persons by reason of or in the course of operations under the contract, whether occurring by reason of acts or omissions of the Contractor or any subcontractor or anyone directly or indirectly employed by them.

CASUALTY INSURANCE

Insurance requirements: The Contractor shall purchase and maintain insurance covering the loss by casualty of all or any part of the contract and/or specifications whether completed or not to indemnify him from losses imposed by law or assumed under contract by the Contractor. Such casualty insurance shall include but not be limited to, loss by, fire, earthquake, landslide, flood, weather, and/or storm, damage resulting from faulty workmanship, construction and/or design and vandalism. The Contractor and IELD shall each be named as insured as their interests may appear (aka Loss Payee ATIMA).

Insurance period: Insurance shall be maintained in effect until final acceptance by IELD of the completed contract.

Partial payment: The making of partial payments to the Contractor shall not create an insurable interest by or for IELD or relieve the Contractor or subcontractors of responsibility for any casualty occurring prior to final acceptance of said contract and specifications.

INDEMNIFICATION

Contractor, its employees, agents, subcontractors and others for whose acts any of them may be legally responsible, shall indemnify and hold harmless IELD, its commissioners, managers, engineers, consultants, agents and employees from and against any and all claims, demands, suits, liability, causes of action, fines, penalties, court costs, damages, losses and expenses (including reasonable attorneys' fees), arising out of or resulting from, occasioned by or in connection with the performance or non-performance of its obligations under the Agreement, on account of any damages, loss or destruction of property or personal injury, including death, to any person, caused in whole or in part by any negligent, grossly negligent, or intentional act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder, and regardless of whether the loss, damage, destruction or injury resulting from same occurs after Contractor has left the property of IELD; or attributable to the release or disposal of or exposure to persons of Contractor's Hazardous Materials, as defined herein; provided however, that this indemnification obligation shall not apply to any claims to the extent arising from the gross negligence or intentionally wrongful acts or omissions of IELD.

For the purposes of this Agreement (if applicable), "Contractor's Hazardous Materials" means any hazardous, toxic or polluting substance, material, chemical, waste or contaminant, or residues thereof, as defined or regulated pursuant to all applicable Laws as may be amended from time to time, that are brought on to IELD's property, furnished, applied, used, stored or released or otherwise introduced into or onto IELD's property by Contractor or any subcontractor or any person for whom Contractor is legally responsible.

Contractor's indemnification obligations shall survive termination of this Agreement for any reason.

MINIMUM COVERAGE

Without limiting any other obligation or liability of the Contractor, Contractor or any of its subcontractors or anyone employed by them directly or indirectly, agrees to obtain and maintain during the term of the Agreement, at its own expense with companies acceptable to IELD, insurance coverage of the type and amount (limits) as follows below:

WORKERS' COMPENSATION/ EMPLOYER'S LIABILITY

Worker's Compensation coverage must be provided by Contractor within the statutory requirements of the Commonwealth of Massachusetts, and \$1,000,000 for those not protected under the Worker's Compensation Statute.

COMMERCIAL GENERAL AND EXCESS LIABILITY INSURANCE

Contractor/Subcontractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella or excess liability insurance with a limit of not less than \$5,000,000 each occurrence.

Example Coverage:

Commercial General Liability - \$5,000,000, OR
Commercial General Liability \$3,000,000 + Excess Liability (Umbrella form)
\$2,000,000 = \$5,000,000

AUTOMOBILE LIABILITY

Contractor/Subcontractor shall maintain commercial auto liability and, if necessary, commercial umbrella or excess liability insurance with a limit of not less than \$5,000,000 each occurrence.

Example Coverage:

Automobile Liability \$5,000,000, OR
Automobile Liability \$2,000,000 + Excess Liability (Umbrella form)
\$3,000,000 = \$5,000,000

SECTION H
TERMS AND CONDITIONS

1.1 DESCRIPTION OF THE WORK

The CONTRACTOR shall provide all Work in connection with upgrading the existing 23 kV relay panels and extending the equipment controls and relays to the control house as set forth in the Specifications, Section D. This Work involves providing all necessary labor, materials and components at the CONTRACTOR's expense, except where expressly stated in the Specifications. All Work shall be performed by qualified personnel in a competent, efficient, timely, and professional manner in accordance with applicable codes, industry standards for similar work, manufacturer specifications, and the Contract Documents.

1.2 PRICE

The CONTRACTOR shall complete the Work specified in the Specifications (Section D) for the Total Lump Sum Price set forth in the Bid Form, Section C. The Prices shall include all work in connection therewith, under the terms as stated in the Contract Documents; and at the Contractor's proper cost and expense to furnish all the materials, supplies, machinery equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete said Work. All Work shall be performed in accordance with the Specifications (Section D).

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided herein.

1.3 COMMENCEMENT AND COMPLETION OF THE WORK

The CONTRACTOR hereby agrees to commence work under this Agreement on or before a date to be specified in written "Notice to Proceed" of the OWNER.

1.4 AMOUNT OF LIQUIDATED DAMAGES

9.

10. Completion on November 9 is expected. Liquidated damages of \$1000/day will be assessed for each day beyond the November 9 deadline.

1.5 COMPLIANCE

The CONTRACTOR agrees not to discriminate against or exclude any person from participation herein on grounds of race, religion, color, sex, age or national origin; or as otherwise prohibited by law.

The CONTRACTOR agrees not to participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1954, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

The CONTRACTOR agrees to comply with all laws applicable to public works projects, regardless of such laws are set forth in the Contract Documents. The CONTRACTOR shall pay current prevailing minimum wage rates for the duration of the Agreement. A copy of the current prevailing wage statement is attached hereto as Exhibit 3.

The CONTRACTOR represents and warrants that all certifications and statements submitted with its bid are true and accurate.

ARTICLE 2 **DEFINITIONS**

2.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the documents specified in paragraph 1 of the Agreement (Section E).

2.1.2 THE AGREEMENT

This Agreement, which consists of the Contract Documents, represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Agreement may be amended or modified only by a permitted Modification as defined in Section E (Agreement), ¶ 1.

2.1.3 THE WORK

The Work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

2.1.4 THE PROJECT

The Project refers to the whole or any part of the Work performed pursuant to the Contract Documents.

2.1.5 "OR EQUAL"

The use of the words "Or Equal" following the name of any manufacturer, vendor or proprietary product shall be understood to mean that articles or materials may be substituted which, in the opinion of the Owner, are equal in quality, durability, appearance, strength, design and performance to the articles

or materials named or described and will perform adequately the intended function, and conforms substantially to the detailed requirements contained in the specifications.

When submitting shop drawing information on articles or materials which are being proposed as substitutes for specified items, the Contractor shall clearly identify them as such. If the articles or materials are accepted as equal to those on which dimensions on the drawings are based, any dimensional variance from those shown and/or specified shall be shown on the shop drawings prepared by the Contractor, illustrating the manner in which conformity to dimensions and design is to be obtained. All such drawings shall be subject to the approval of the Owner and the installation of the article shall not proceed without first obtaining said approval.

2.1.6 SITE

The Site is the location of the Work as set forth in the Specifications.

2.1.7 OTHER DEFINITIONS

All other capitalized terms shall have the meaning set forth in the Contract Documents.

ARTICLE 3 **EXECUTION, CORRELATION AND INTENT**

3.1.1 By executing the Agreement, the Contractor represents that he is familiar and experienced with the Work has familiarized himself with the local conditions under which the Work is to be performed and correlated its observations with the requirements of the Contract Documents.

3.1.2 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable therefrom as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

3.2.3 The organization of the Specifications into divisions, sections and articles, and the arrangement of drawings shall not govern the Contractor's division of the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

ARTICLE 4 **OWNERSHIP AND USE OF DOCUMENTS**

All drawings, Specifications and copies thereof furnished by the Owner are and shall remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without the prior written consent of the Owner. With the exception of one original of the Agreement for each party's records, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory

requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

ARTICLE 5

ADMINISTRATION OF THE CONTRACT

5.1. The Owner may visit the Site(s) at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Owner shall not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

5.2 The Owner shall at all times have access to the Site(s) and reasonable access to the Work wherever it is in preparation and progress. The Contractor shall provide reasonable facilities for such access so the Owner may perform its functions under the Contract Documents.

5.3 Based on the Owner's observations and an evaluation of the Contractor's Applications for Payment, the Owner will determine the amounts owing to the Contractor and will approve invoices and/or issue Certificates for Payment in such amounts, as provided in Paragraph 12.4.

5.4 The Owner will render information necessary for the proper execution or progress of the Work within ten (10) business days of any request by the contractor or in accordance with any time limit agreed upon.

5.5 The Owner shall have authority to reject Work which does not conform to the Contract Documents. Whenever, in its reasonable opinion, the Owner considers it necessary or advisable for the implementation of the intent of the Contract Documents, the Owner will have authority to require special inspection or testing of the Work in accordance with Subparagraph 10.7.2 whether or not such Work be then fabricated, installed or completed. Any such rejection of work shall not relieve the Contractor of the responsibility for maintaining protection of the Work and the Owner's or the customers' property.

5.6 The Owner will review and approve or take other appropriate action upon Contractor's submittals such as shop drawings, product data and samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action shall be taken with reasonable promptness so as to cause no delay. The Owner's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

5.7 The Owner will prepare Change Orders in accordance with Article 15 and will have authority to order minor changes in the Work as provided in Subparagraph 15.4.1.

5.8 The Owner will conduct inspections to determine the date of Substantial Completion and Final Completion, will review written warranties and related documents required by the Agreement and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of Paragraph 12.8.

ARTICLE 6
OWNER'S RIGHTS AND OBLIGATIONS

6.1 INFORMATION AND SERVICES REQUIRED OF THE OWNER

6.1.1 Upon the Contractor's request, the Owner shall furnish all existing information describing the physical characteristics, legal limitations, customer addresses, and meter locations for the Site(s) as needed for the Contractor to perform its obligations under the Contract Documents.

6.1.3 The Owner shall furnish all instructions directly to the Contractor.

6.2 OWNER'S RIGHT TO STOP THE WORK

6.2.1 If the Contractor fails to correct defective Work as required by Paragraph 10.7 or fails to carry out the Work in accordance with the Contract Documents or if the Owner shall for any other reason so require, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated or until further written notice from the Owner; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 9.1.3. The Contractor shall resume the Work after such stoppage promptly upon written notice to do so from the Owner. If such stoppage is required through no fault of the Contractor, the Contract Time (and the dates for achieving Substantial Completion and Final Completion) shall be extended by a period equal to the period of the stoppage, and the Contractor shall be compensated for its reasonable and justifiable costs incurred as a result of such stoppage.

6.3 OWNER'S RIGHT TO CARRY OUT THE WORK

6.3.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within seven (7) days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, perform such work or cause such work to be performed and/or make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for additional services made necessary by such default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover the amount, the Contractor shall pay the difference to the Owner.

ARTICLE 7
CONTRACTOR'S RIGHTS AND OBLIGATIONS

7.1 REVIEW OF CONTRACT DOCUMENTS

7.1.1 The Contractor shall carefully study and compare the Contract Documents and shall promptly report to the Owner any apparent error, inconsistency, or omission. The Contractor shall not be liable to the Owner for any damage resulting from errors, inconsistencies, or omissions in the

Contract Documents which he discovers but shall be liable for damage to the extent he reasonably should have but failed to discover such errors, inconsistencies, or omissions. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, manufacturer instructions, approved shop drawings, product data or samples for such portion of the Work.

7.2 SUPERVISION PROCEDURES

7.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall maintain adequate supervisory personnel at the Site during the performance of the Work. The Contractor shall be solely responsible for all Work means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Agreement.

7.2.2 The Contractor shall be responsible to the Owner for the acts and omissions of its employees, Subcontractors (when permitted) and their agents and employees, and other persons performing any of the Work under a contract with the Contractor. This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the Work.

7.2.3 The Contractor shall not be relieved from its obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in its administration of the Contract, or by inspection, tests or approvals required or performed under Paragraph 10.7 by persons other than the Contractor.

7.3 LABOR AND MATERIALS

7.3.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and service necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. The Owner shall supply the new AMI meters, at its expense.

7.3.2 At all times, the Contractor shall enforce strict discipline and good order among its employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned, including all persons on the Site controlled directly or indirectly by the Contractor.

7.4 TAXES

7.4.1 The Contractor shall pay all applicable sales, consumer, use and other similar taxes for the Work or portion thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.

7.4.2 Owner is exempt from payment of Massachusetts state and local taxes on tangible property and services and will not reimburse Contractor for such taxes incurred by Contractor provided

that the Owner provides Contractor with a valid tax exemption certificate, except as otherwise specifically provided for in these Contract Documents. Contractor shall be liable for and shall pay any sales, use, excise or other tax which may be imposed upon any of the goods or their sale, use or delivery.

7.5 PERMITS, FEES AND NOTICES

7.5.1 Unless otherwise expressly provided in the Contract Documents, the Contractor shall secure and pay for all permits and fees, licenses, and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received, and the same shall at all times be the property of the Owner and shall be delivered to the Owner upon completion of the Project.

7.5.2 The Contractor shall provide all required notices and comply with all federal, state, or local laws or ordinances bearing on the performance of the Work. The Contractor shall provide the Owner with reproductions of all permits, licenses and receipts for any fees paid.

7.5.3 If the Contractor observes that any of the Contract Documents are at variance with applicable laws, statutes, codes, and regulations in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be accomplished by appropriate Modification.

7.5.4 If the Contractor performs any Work which he knows or should know is contrary to any applicable laws or local ordinances, the Contractor shall assume full responsibility therefor and shall bear all costs attributable thereto.

7.6 SUPERINTENDENT

7.6.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

7.7 SCHEDULE

7.7.1 The Contractor, immediately after being awarded the Agreement, shall meet with the OWNER and prepare and submit for the Owner's information a detailed progress schedule for the Work. The schedule shall be related to the entire Project to the extent required by the Contract Documents and shall provide for expeditious and practicable execution of the Work. Such schedule and sequencing shall take into consideration the impact on operations, known conditions, and recommendations of the Owner.

7.8 DOCUMENTS AND SAMPLES AT THE SITE

7.8.1 The Contractor shall maintain for the Owner one record copy of any and all drawings, Specifications, Addenda, Change Orders and other Modifications, and "as-built" drawings and Specifications in good order and marked currently to record all changes made during construction, and

approved shop drawings, product data and samples. These records shall be available to the Owner upon completion of the Work in the number and forms set forth in the Scope of work and Specifications, Section D. The Contractor shall comply with all recordkeeping and tracking requirements as set forth in Section D.

7.9 USE OF SITE(S)

7.9.1 The Contractor shall confine operations at the Site(s) to areas permitted by the Owner subject to applicable law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the Site with any materials or equipment.

7.9.2 The Contractor shall have access to the Site(s) necessary to perform the Work, including ingress and egress, subject to the limitations set forth in Section D.

7.10 CUTTING AND PATCHING OF WORK

7.10.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

7.10.2 The Contractor shall not damage or endanger any portion of the Work, the meters, or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work or equipment, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor his consent to cutting or otherwise altering the Work.

7.11 CLEANING UP/HAZARDOUS MATERIALS

7.11.1 The Contractor, at all times, shall keep the premises free from accumulation of debris or rubbish caused by its operations. At the completion of the Work at each Site, the Contractor shall remove all its debris and rubbish from the Sites in full compliance with all applicable laws and regulations as well as all its tools, construction equipment, machinery and surplus materials and the Project shall be thoroughly cleaned and ready for immediate occupancy by the Owner. All non-hazardous debris, metal, etc. will be collected in a dumpster provided by and removed by the Contractor. The Contractor shall identify and coordinate the collection of potentially hazardous waste with the Owner. The Owner will manage the collection and dispose of hazardous waste. All removed meters shall be returned to the designated storage facility.

7.11.2 If the Contractor fails to clean up at the completion of the Work, the Owner may do so as provided in Paragraph 6.3 and the cost thereof shall be charged to the Contractor.

7.11.3 Under no circumstances shall the Contractor provide materials or components, which contain PCBs or asbestos. This prohibition includes items such as, but not limited to, packings, seals, gaskets, or insulation, regardless of whether the item is encapsulated or asbestos fibers are impregnated with a binder material. The restriction shall apply to all materials and/or chemicals which contain lead, chromium, mercury, selenium, barium, cadmium, silver or their respective compounds; benzene;

Chlorofluorocarbons, such as Freon; and chlorinated hydrocarbons such as but not limited to 1,1,1-Trichloroethane, Perchloroethylene, Carbon Tetrachloride, or Methylene Chlorite, etc. In the instance or application where no other material is an acceptable or feasible substitute for any of the above referenced items, the Contractor shall, in writing inform the Owner of the pertinent facts regarding the application. The Owner will respond, in writing, with the disposition of the material or chemical component. No verbal requests and dispositions shall be contractually binding unless accompanied by an MSDS Form and such requests and dispositions are confirmed in writing and accepted by the Owner.

7.12 ROYALTIES AND PATENTS

7.12.1 The Contractor shall be responsible for paying all royalties and license fees, as applicable. The Contractor shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when Owner combines Contractor's work with other goods or services without written authorization by Contractor or when a particular design, process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor believes or has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner, and thereafter the Owner insists on the use of the design, process or products specified.

7.13 INDEMNIFICATION

7.13.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, its commissioners, managers, engineers, consultants, agents and employees from and against any and all third party claims, demands, suits, liabilities, causes of action, fines, penalties, court costs, damages, losses and expenses, including but not limited to reasonable attorneys' fees, arising out of or resulting from, occasioned by or in connection with the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, to the extent caused by any negligent, grossly negligent, or intentional act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except to the extent caused by a party indemnified hereunder; or (2) arises from taxes for which Contractor or Subcontractor is liable under this Agreement; or (3) is attributable to the release or disposal of or exposure to persons to the Contractor's Hazardous Materials as defined herein; or (4) results from violations of applicable laws, regulations, ordinances or rulings; or (5) arising from any material misrepresentation of the Contractor under this Agreement; provided however, that this obligation shall not apply to any claims to the extent arising from the negligence or gross negligence or intentionally wrongful acts or omissions of the Owner. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 7.13. For the purposes of this Agreement, "Contractor Hazardous Materials" means any hazardous, toxic or polluting substance, material, chemical, waste or contaminant, or residues thereof, as defined or regulated pursuant to all applicable laws and regulations as may be amended from time to time ("Hazardous Materials"), and that are brought on to the Site, furnished, applied, used, stored or released or otherwise introduced into or on to the Site by the Contractor or any Subcontractor or any person for whom Contractor is legally responsible. In no event shall the Contractor be liable for any pre-existing hazardous materials at the Site.

7.13.2 In any and all claims against the Owner or any of its agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 7.13 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

7.14 LIENS

7.14.1 Contractor shall keep the Work, the Site(s), the equipment and the materials free from and indemnify, defend and hold Owner harmless from the existence of all liens, charges, claims and judgments, security interests, and encumbrances ("Liens") arising out of the performance of the Work under this Agreement. If Owner seeks indemnification by Contractor for any Lien, Owner shall (a) give Contractor prompt notice of any Lien of which it has knowledge; (b) cooperate in the defense of the Lien at Contractor's expense and (c) give Contractor control of the defense and settlement, to the extent of Contractor's liability, of the Lien at Contractor's expense; *provided* that Contractor shall promptly confirm in writing its obligation to indemnify Owner with respect to all costs and expenses with respect to the Lien. Contractor shall take prompt steps to discharge any Lien field against the Work, the Site, any equipment, any material and any structures comprising Owner's facilities or located on the Site by any Subcontractor based on a claim for payment in connection with the Work. If Contractor fails to discharge any Lien within thirty (30) days after written notice from Owner of such Lien, Owner shall have the right, upon notifying Contractor in writing, to take any reasonable action to satisfy, defend, settle, or otherwise remove the Lien at Contractor's expense, including reasonable attorney's fees, costs, and expenses. Owner shall have the right to deduct and offset any expenses so incurred from any payment due, or which may become due, to Contractor under this Agreement and to recover those expenses from Contractor. Contractor shall have the right to contest any Lien; *provided* that it first must provide to the lien holder, a court or other appropriate third person as applicable, a bond or other assurances of payment necessary to remove the Lien and all other encumbrances related to the Work from the Site in accordance with all applicable laws. Contractor's indemnity obligations set forth in this Section 7.14 shall survive the termination of this Agreement. The Parties further agree that the waiver of Liens herein shall operate as an independent covenant in favor of Owner and its successors and assigns and shall operate and be effective with respect to work done and materials and services furnished under any supplemental contract for extra work in connection with the effort for the Project as well as to any work and labor done and materials furnished under this Agreement.

ARTICLE 8 **SUBCONTRACTORS**

8.1 DEFINITIONS

8.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or its authorized representatives. The term Subcontractor does not include any separate contractor or its subcontractors.

8.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

8.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

8.2.1 Unless otherwise required by the Contract Documents, the Contractor, as soon as practicable after the award of the Contract, shall furnish to the Owner in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Owner will reply to the Contractor in writing within ten (10) business days stating whether or not the Owner, after due investigation, has reasonable objection to any such proposed person or entity.

8.2.2 The Contractor shall not contract with any such proposed person or entity to whom the Owner has made reasonable objection under the provisions of Subparagraph 8.2.1. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.

8.2.3 If the Owner has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner has no reasonable objection.

8.2.4 The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner makes reasonable objection to such substitution.

8.3 SUBCONTRACTUAL RELATIONS

8.3.1 By an appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor (where permitted), to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner. Said agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its Sub-subcontractors. The Contractor shall make availability to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 8.3 and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to its Sub-subcontractors. The Contractor shall be fully responsible to the Owner for the acts and omissions of all Subcontractors and other entities or persons directly or indirectly employed by him to perform the Work. If requested by the Owner, the form and substance of any Subcontract with the Contractor shall be subject to the prior written consent of the Owner, which consent shall not be unreasonably withheld or delayed.

ARTICLE 9
WORK BY OWNER OR BY SEPARATE CONTRACTORS

9.1 **OWNER'S RIGHT TO PERFORM WORK AND TO AWARD
SEPARATE CONTRACTS**

9.1.1 The Owner reserves the right to perform work related to the furnishing and installation of the Work with its own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar conditions of the Agreement.

9.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

9.1.3 The Owner will provide for the coordination of the work of its own forces and of each separate contractor with the Work of the Contractor, who shall cooperate therewith as provided in Paragraph 9.2.

9.2 **MUTUAL RESPONSIBILITY**

9.2.1 The Contractor shall afford the Owner and separate contractors a reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work and shall connect and coordinate its Work with theirs as required by the Contract Documents.

9.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Owner any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the Owner's or separate contractors' work as fit and proper to receive its Work, except as to defects which may subsequently become apparent in such work by others.

9.2.3 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefor.

9.2.4 Should the Contractor cause damage to the work or property of the Owner, or to other work on the site, the Contractor shall promptly remedy such damage as provided in Subparagraph 13.2.5.

9.2.5 Should the Contractor wrongfully cause damage to the work or property of any separate contractor, the Contractor shall upon due notice promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitrations costs which the Owner has incurred.

9.3 OWNER'S RIGHT TO CLEAN UP

9.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Paragraph 7.11, the Owner may clean up and charge the cost thereof to the contractors responsible therefor.

ARTICLE 10 MISCELLANEOUS PROVISIONS

10.1 GOVERNING LAW, VENUE, PERSONAL JURISDICTION

10.1.1 The Agreement shall be governed by the law of the Commonwealth of Massachusetts without regard to choice of law principles. All applicable provisions of federal, state, or local laws, by-laws, rules, or regulations are incorporated into the Agreement as if fully set forth herein and shall prevail over any conflicting provisions of these terms and conditions. All actions brought under or arising out of this Agreement shall be brought in the appropriate state or federal court located exclusively in the Commonwealth of Massachusetts. Each party consents to the jurisdiction of and to the laying of venue in such court and waive any defense based on lack of venue, personal jurisdiction or inconvenient forum.

10.2 SUCCESSORS AND ASSIGNS

10.2.1 The Owner and the Contractor each bind itself, its partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Agreement or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner, which shall not be unreasonably withheld.

10.3 WRITTEN NOTICE

10.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice. Written Notice to the Owner shall be delivered to: General Manager, **FOWLER'S LANE #5 SUBSTATION UPGRADE PROJECT**, Ipswich Electric Light Department, 272 High Street, Ipswich, MA 01938, with a copy to Christopher Pollart, Esq., at CPollart@k-plaw.com. In the case of the Contractor, written Notice shall be delivered to the person listed on the Bid Form (Section C).

10.4 CLAIMS FOR DAMAGES

10.4.1 Should either party to the Agreement suffer injury or damage to person or property because of any act or omission of the other party or of any of its employees, agents or others for whose

acts he is legally liable, claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage. The reasonable time shall not exceed fourteen (14) days.

10.5 PAYMENT BOND

10.5.1 The Contractor shall furnish a Payment Bond in an amount at least equal to fifty percent (50%) of the Lump Sum Price as security for the payment of all persons performing labor on the project under this Agreement and furnishing materials in connection with this Agreement. The **PAYMENT BOND** shall be in a separate instrument and in substantially the same form appearing in Section F as acceptable to the Owner and shall remain in effect through the Warranty Period or any Extended Warranty Period, as defined in the Agreement (Section E). The Warranty Period Shall commence on the Final Completion Date.

10.6 RIGHTS AND REMEDIES

10.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law, except as otherwise set forth therein.

10.6.2 No action or failure to act by the Owner or Contractor shall constitute a waiver of any right or duty afforded any of them under the Agreement, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

10.7 WARRANTY

10.7.1 Contractor represents and warrants that through the end of the Warranty Period, that (i) all services will be provided in accordance with the Contract Documents, applicable laws and codes, and industry standards, and to the extent a conflict exists, the Contractor promptly shall notify the Owner; (ii) all services and where applicable, all materials used in performing the Work will be free from errors, defects and damage in material and workmanship; (iii) where applicable, all materials used in the Work shall be new and of recent manufacture when installed unless the Parties agree otherwise in advance and in writing; (iv) all materials used in the Work will be of good quality and good condition; and (v) all of Owner's meters and all materials, parts, and equipment used in providing the services shall be delivered, handled, stored (whether onsite or offsite) and installed in accordance with all manufacturer's instructions and in a manner that does not void or impair manufacturer warranties. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of the services, materials and equipment. Further, the Contractor represents and warrants that through the end of the Warranty Period, the Work will be performed in accordance with the Contract Documents and shall be performed and installed to permit the Project to operate in accordance with the Specifications. The Contractor shall, at its sole expense, repair, modify, correct or replace defective workmanship and any materials and equipment for which the Contractor is responsible ("Defects") and shall provide labor and materials, and shall cover all costs of transportation, reassembly, removal and replacement of such Defects within the Warranty Period, within a reasonable time upon notice from the Owner, and in prompt fashion, and shall demonstrate to the satisfaction of the Owner that the Defects have been properly corrected. Provided however the Contractor shall not be responsible to replace any damaged or

defective meters, unless such damage was caused by the Contractor. The Owner shall provide notice of such Defect or nonconformity within 30 days of discovery. With respect to any such corrected work, the Warranty Period shall be extended for an additional period, as stated in the Agreement (Section E) after the correction of any Defect. Contractor shall use commercially reasonable efforts to remedy any failure or breach of Warranty so as to minimize revenue loss to Owner and to avoid disruption of Owner's operations at the Site. This warranty shall not apply to any loss or damage resulting from: (i) normal wear and tear; (ii) alteration, neglect, misuse, abuse, or improper installation, operation, maintenance, or storage by Owner or a third party; (iii) accident, fire, flood, or acts of God; or (iv) inaccurate or incomplete information or data supplied or approved by Owner.

10.7.2 In addition to these warranty requirements, to the extent applicable, the Contractor shall provide written equipment and material warranties offered in the Contractor's published data, without exclusion or limitation, in the Owner's name. At the end of the Warranty Period, the Contractor shall transfer any manufacturer's equipment and material warranties still in force to the Owner.

10.7.3 In addition to Contractor's warranties and subject to Section 7.7.4 below, Contractor shall use its best efforts to obtain written warranties and guarantees for the benefit of Contractor and Owner from equipment, suppliers, vendors, and Subcontractors in relation to their respective portions of the Work which warrant against defects and deficiencies in each Subcontractor's work during the Warranty Period. Contractor shall promptly provide to Owner copies of all Subcontractor warranties and guarantees that Contractor obtains. Those warranties and guarantees shall provide that they survive Owner and Contractor verifications, inspections and approvals and shall be assignable to Owner. On or after the final term of the applicable Warranty Period, at the request of Owner, Contractor shall assign to Owner any Subcontractor warranty that has not otherwise expired.

10.7.4 Contractor shall have primary liability to Owner with respect to the warranties in this Article 10, whether or not any Defect or other matter is also covered by a warranty of a Subcontractor or other third party, and Owner shall pursue only Contractor for any required corrective action. In addition, such warranties shall not be restricted in any manner by any warranty of a Subcontractor or other third party, and the refusal of a Subcontractor or other third party to provide or honor a warranty or to correct defective, deficient or non-conforming Work or equipment or materials shall not excuse Contractor from its liability on such warranties to Owner.

10.7.5 To the extent applicable, Contractor represents and warrants that it shall provide to Owner, as to all portions of the Work for which Owner has paid (excluding any amounts withheld or offset by Owner against any payment sought by Contractor), good, exclusive, and marketable title free and clear of all encumbrances, liens, security interests and other defects in title. In the event of any non-conformity with or breach of this warranty, Contractor, at its own expense, shall promptly, upon receipt of statutory notice of a lien, pay or discharge, or post a bond against, any such lien or encumbrance. All warranty obligations shall survive termination of the Agreement.

ARTICLE 11 **TIME**

11.1 DEFINITIONS

11.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial and Final Completion of the Work as defined in Subparagraph 11.1.3, including authorized adjustments thereto. Time is of the essence with regard to completion of the Work required by the Agreement.

11.1.2 The date of commencement of the Work is the date established in a notice to proceed. If there is no notice to proceed ("Notice to Proceed"), it shall be the date of the Agreement or such other date as may be established therein.

11.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Owner when the Work is substantially complete, in accordance with the Contract Documents, other than only custom punch list items. The Final Completion Date is the date on which all Work and punch list items, as defined in paragraph 12.6, are completed and the Owner approves the final Invoice in accordance with Paragraph 12.7.1 hereof.

11.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically designated.

11.2 PROGRESS AND COMPLETION

11.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.

11.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 11.1.2. The Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time, and Final Completion thereafter in accordance with the provisions of the Contract Documents.

11.3 DELAYS AND EXTENSIONS OF TIME

11.3.1 If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Owner or by any employee of the Owner, or by any separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably anticipated, unavoidable casualties, or any causes beyond the Contractor's or its Subcontractor's control, or by delay authorized by the Owner, then, provided such delay in no way results from the act or neglect of the Contractor or any of its Subcontractors, the Contract Time shall be extended by Change Order for such reasonable time to overcome the event that caused such delay.

11.3.2 Any claim for extension of time shall be made in writing to the Owner not more than five (5) days after the commencement of the delay; otherwise it shall be waived. In the case of a continuing delay only one claim is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work.

11.3.3 Interpretations shall be furnished in accordance with the provisions of G.L. c. 30, § 39P, as set forth in **SUPPLEMENTARY GENERAL TERMS AND CONDITIONS**, set forth in the Appendix or as soon as practicable.

11. 11.4 LIQUIDATED DAMAGES – Completion on December 3 is expected. Liquidated damages of \$1000/day will be assessed for each day beyond the December 3 deadline.

ARTICLE 12 **PAYMENTS AND COMPLETION**

12.1 CONTRACT SUM

12.1.1 The Contract Sum is stated in Section 1.2 of the Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

12.2 INVOICES

12.2.1 The Contractor shall submit invoices to the Owner for the Work, supported by such data substantiating the Contractor's right to payment as provided elsewhere in the Contract Documents in accordance with the milestone schedule mutually agreed by Contractor and Owner prior to commencement of the Work. All invoices shall be sent to Anthony Calascibetta <acalascibetta@ipswichutilities.org> 90% upon completion with final 10% payable after acceptance.

12.2.2 Payments will be made in accordance with the Contract Documents and the milestone schedule mutually agreed by the Contractor and Owner and attached to the Agreement, if any.

12.2.3 The title and right of possession of equipment and parts repaired or modified hereunder shall remain with the Owner. Title to equipment and parts supplied hereunder shall pass to Owner upon delivery to the FOB point of destination, which shall be Owner's Facility. The Contractor warrants that title to all Work covered by an invoice will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first. To the extent Owner shall have made payments owed by it under the Contract Documents, such equipment and parts shall be free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 12 as "liens."

12.3 APPROVAL OF INVOICES

12.3.1 The Owner will, within ten (10) days after the receipt of the Contractor's invoice, approve payment of an invoice for such amount as the Owner determines is properly due under such invoice, or notify the Contractor in writing its reasons for withholding a payment as provided in Subparagraph 12.5.1.

12.3.2 The approval of the invoice will constitute a representation by the Owner, based on its observations at the Site as provided in Paragraph 5.1 and the data submitted in support of the invoice, that the Work has progressed to the point indicated; that, to the best of its knowledge, information and belief, the quality of Work is in accordance with the Contract Documents (subject to an evaluation of the

Work for conformance with the Contract Document upon completion, to the results of any subsequent tests required by or performed under the Contract Documents correctable prior to completion, and to any specific qualifications stated in its approval); and that the Contractor is entitled to payment in the amount approved. However, by approving an invoice, the Owner shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

12.4 PROGRESS PAYMENTS

12.4.1 After the Owner has approved an invoice, the Owner shall pay such invoice within thirty (30) days after Contractor's delivery thereof to Owner. The Owner may withhold five percent (5%) of the total Contract price ("Retainage") which Retainage shall be released to the Contractor upon Final Completion of the Work.

12.4.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in similar manner.

12.4.3 The Owner may, on request and at its discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Owner on account of Work done by such Subcontractor.

12.4.4 The Owner shall not have any obligation to pay or to see to the payment of any moneys to any Subcontractor except as may otherwise be required by law.

12.4.5 No approval of an invoice or progress payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents. Except to the extent of Contractor's negligence or willful misconduct, Owner shall be responsible for any damage that occurs during partial or entire use or occupancy of the Project.

12.5 PAYMENTS WITHHELD

12.5.1 The Owner shall decline to approve payment and withhold its approval in whole or in part, to the extent necessary reasonably to protect itself. If the Owner is unable to approve payment of an invoice, he will notify the Contractor as provided in Subparagraph 12.3.1. If the Contractor and the Owner cannot agree on a revised amount, the Owner will approve payment for the amount for which it determines is properly due. The Owner may also decline to approve payment or, because of subsequently discovered evidence or subsequent observations, as may be necessary in its opinion to protect itself from loss because of:

1. defective work not remedied,

2. failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment,
3. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,
4. damage to the Owner, Site owner, or another contractor,
5. reasonable evidence that the Work will not be completed within the Contract Time, or
6. material failure to carry out the Work in accordance with the Contract Documents.

12.5.2 When the above grounds in Subparagraph 12.5.1 are removed, payment shall be made for amounts withheld because of them.

12.6 SUBSTANTIAL COMPLETION

12.6.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Subparagraph 11.1.3, the Contractor shall prepare for submission to the Owner a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Owner on the basis of an inspection determines that the Work or designated portion thereof is substantially complete, he will then prepare for a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibility assigned to them in such Certificate.

12.6.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and Certification by the Owner, the Owner shall make payment, for such Work or portion thereof, as provided in the Contract Documents.

12.7 FINAL COMPLETION AND FINAL PAYMENT

12.7.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final invoice, the Owner will promptly make such inspection and, when it finds the Work acceptable under the Contract Documents and the Contract fully performed, it will promptly approve payment of the final invoice stating that to the best of its knowledge, information and belief, and on the basis of its observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due to the Contractor is due and payable.

12.7.2 Neither the final payment nor the Retainage shall become due until the Contractor submits to the Owner (1) an affidavit that all payrolls, bills for materials and equipment, and other

indebtedness connected with the Work for which the Owner or its property might in any way be responsible, have been fully paid or otherwise satisfied, (2) consent of surety, if any, to final payment and (3), if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as the written document described in Paragraph 16.2.2, receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

12.7.3 If, after Substantial Completion of the Work, final completion thereof is delayed for more than ninety (90) days through no fault of the Contractor or by the issuance of Change Orders affecting final completion, the Owner shall, upon application by the Contractor, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. The remaining balance for Work not fully completed or corrected shall not be less than the Retainage as stipulated herein, and as bonds will have been furnished as provided in Paragraph 10.5, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Owner prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

12.8.4 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

- .1 unsettled liens,
- .2 faulty or defective Work appearing after Substantial Completion,
- .3 failure of the Work to comply with the requirements of the Contract Documents,
or
- .4 terms of any special warranties required by the Contract Documents.
- .5 obligations under the Performance and Payment Bonds.

12.8.5 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled prior to the time of the final invoice.

ARTICLE 13 **PROTECTION OF PERSONS AND PROPERTY**

13.1 SAFETY PRECAUTIONS AND PROGRAMS

13.1.1 The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The imposition of any safety requirements by the Owner, including minimum Personal Protection Equipment (PPE) requirements, shall not impose a duty on the Owner for the safety of the Contractor, its employees, or any other person.

13.2 SAFETY OF PERSONS AND PROPERTY

13.2.1 The Contractor shall comply with all applicable safety codes and standards, and shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. all employees and Subcontractors performing the Work and all other persons who may be affected thereby, including any other contractors, licensees or invitees at the Site(s);
2. all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of its Subcontractors or Sub-subcontractors; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

13.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

13.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

13.2.4 When the use or storage of potentially dangerous or hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

13.2.5 The Contractor shall promptly remedy all damage or loss to any property referred to in Section 16.2 caused by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Section 16.2., except damage or loss attributable to the acts or omissions of the Owner, or anyone directly or indirectly employed by the Owner, or by anyone for whose acts the Owner may be liable, and not attributable to the acts or omissions of the Owner, or anyone directly or indirectly employed by Owner, or by anyone for whose acts it may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the obligation under Article 7 and Section 10.7.

13.2.6 The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner.

13.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

13.3 EMERGENCIES

13.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at its discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 15 for Changes in the Work.

ARTICLE 14 **INSURANCE**

14.1 CONTRACTOR'S LIABILITY INSURANCE

14.1.1 The Contractor will furnish and maintain insurance with the coverages and limits set forth in Section G **INSURANCE**, at its own expense, without limiting its indemnity under this Agreement and provide evidence of the coverage on certificates issued by Contractor's insurance broker as required in Section G, **INSURANCE**, on behalf of the carriers qualified to do business in the Commonwealth of Massachusetts having a Best rating of A- and a financial classification of IX or better. The insurance shall be effective as of the date of the Notice to Proceed. Deductible amounts shall be the responsibility of the Contractor. Such coverage shall include the following:

1. Include Owner and its commissioners, agents, and employees as additional insureds for the activities and operations under this Agreement;
2. Severability-of-Interest or Cross-Liability Paragraph;
3. A copy of the additional insured blanket endorsement.

14.2 The insurance required by Subparagraph 14.1. shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater.

14.3 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be cancelled until at least thirty days prior written notice has been given to the Owner by the Contractor. Certificates of renewal shall be delivered to the Owner within fifteen (15) days following the expiration date of any insurance policy. The Contractor shall not commence the Work until all insurance required hereunder shall have been obtained and approved by the Owner, and the Contractor shall not permit any Subcontractor or Sub-subcontractor to commence work until all insurance required of them shall have been similarly obtained and approved. Coverage shall remain effective for a period of one (1) year after termination of the Owner-Contractor Agreement for any reason.

ARTICLE 15 **CHANGES IN THE WORK**

15.1 CHANGE ORDER

15.1.1 A Change Order is a written order to the Contractor signed by the Owner and Contractor, issued after execution of the Contract, authorizing a change in the Work or Specifications or an

adjustment in the Contract Sum or the Contract Time as provided in G.L. c. 30, §§ 39I and 39N. The Contract Sum and the Contract Time may be changed only by Change Order.

15.1.2 The Owner, without invalidating the Contract, may request changes in the Work within the general scope of the Contract consisting of permitted additions, deletions or other revisions to the Specifications, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order and shall be performed under the applicable terms and conditions of the Contract Documents.

15.1.3 The cost or credit to the Owner resulting from a change in the Work shall be determined in one or more of the following ways:

- .1 by mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 by unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 by the method provided in Subparagraph 15.1.4.

15.1.4 If none of the methods set forth in Paragraphs 15.1.3.1, 15.1.3.2 or 15.1.3.3 is agreed upon, the Contractor, provided he receives a written order signed by the Owner and accepted in writing by the Contractor, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Owner and Contractor on the basis of the reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Paragraphs 15.1.3.3 and 15.1.3.4 above, the Contractor shall keep and present an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: actual cost of materials, not including sales tax and cost of delivery; wages at rates set forth in the Contract Documents; rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. Pending final determination of cost to the Owner, payments on account shall be made on the Owner's Certificate for Payment. The amount of credit to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in the Contract Sum will be the amount of the actual net cost. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

15.1.5 Prices stated in the Bid Form and the Contract shall include all costs of the Contractor to the Owner as listed in Paragraph 15.1.4. No additional charges shall be allowed for these items under any circumstances.

15.2 CONCEALED CONDITIONS

15.2.1 Should concealed conditions encountered in the performance of the Work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Sum shall be equitably adjusted by Change Order upon claim by either party made within twenty days after the first observance of the conditions.

15.3 CLAIMS FOR ADDITIONAL COSTS

15.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum due to changes in the Work or the conditions, he shall give the Owner written notice thereof within twenty days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 13.3. No such claim shall be valid unless so made. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

15.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation by the Owner or Engineer, (2) any order by the Owner to stop the Work pursuant to Paragraph 6.2 where the Contractor was not at fault, (3) any written order for a minor change in the Work issued pursuant to Paragraph 15.4, or (4) failure of payment by the Owner pursuant to Paragraph 12.7, the Contractor shall make such claim as provided in Subparagraph 15.3.1.

15.4 MINOR CHANGES IN THE WORK

15.4.1 A duly authorized representative of the Owner shall have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be affected by written order, and shall be binding on the Owner, Engineer, and the Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 16 **UNCOVERING AND CORRECTION OF WORK**

16.1 UNCOVERING OF WORK

16.1.1 If any portion of the work should be covered contrary to the request of the Owner or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner, be uncovered for its observation and shall be replaced at the Contractor's expense.

16.1.2 If any other portion of the Work has been covered which the Owner has not specifically requested to observe prior to being covered, the Owner may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the

cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it is found that this condition was caused by the Owner or a separate contractor as provided in Article 9, in which event the Owner shall be responsible for the payment of such costs.

16.2 CORRECTION OF WORK

16.2.1 The Contractor shall promptly correct all Work rejected by the Owner or the Owner's Engineer as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Owner's additional services made necessary thereby.

16.2.2 [Intentionally omitted.]

16.2.3 The Contractor shall remove from the Site(s) all portions of the Work which are defective or non-conforming and which have not been corrected under Subparagraph 10.7.1, and 16.2.1, unless removal is waived by the Owner in writing.

16.2.4 If the Contractor fails to correct defective or nonconforming Work as provided in Subparagraphs 10.7.1 and 16.2.1, the Owner may correct it in accordance with Paragraph 6.3.

16.2.5 If the Contractor does not proceed with the correction of such defective or non-conforming Work within a reasonable time fixed by written notice from the Owner, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the Owner may upon ten additional days' written notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Owner's additional services made necessary thereby. If such proceeds of sale do not cover all costs which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

16.2.6 The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.

16.2.7 Nothing contained in this Paragraph 16.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Paragraph 10.7 hereof. The establishment of the time period of two years after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligation other than specifically to correct the Work.

16.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

16.3.1 If the Owner prefers to accept defective or nonconforming Work, the Owner may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. If the Owner undertakes to correct the defective or nonconforming Work due to the Contractor's failure as provided in Section 16.2.4, such equitable adjustment shall take into consideration additional costs to correct such defective or nonconforming work and any other direct damages or costs incurred by the Owner arising from the Contractor's failure. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 17 **TERMINATION OF THE CONTRACT**

17.1 TERMINATION BY THE CONTRACTOR

17.1.1 If the Owner unjustifiably has not made payment upon an approved Invoice as provided in Paragraph 12.4, then the Contractor may, upon thirty (30) additional days written notice to the Owner, terminate the Contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, and construction equipment and machinery.

17.2 TERMINATION BY THE OWNER

17.2.1 To the extent permitted by law, if the Contractor is adjudged a bankrupt, or if he makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its insolvency, or if he refuses or fails, repeatedly except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he fails to make prompt proper payment to Subcontractors for materials or labor, or disregards laws, or order of any public authority having jurisdiction, or otherwise fails to comply with any provision of the Contract Documents including these terms and conditions and such non-compliance remains uncured for more than 10 days, then the Owner may, without prejudice to any right or remedy and after giving the Contractor and its surety, if any, seven days' written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method he may deem expedient.

17.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Owner's additional services made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The obligation to pay said amount to the Contractor or to the Owner, as the case may be, shall survive the termination of the Agreement.

17.2.3 If the Owner terminates the Agreement for the Owner's convenience, the Owner shall compensate the Contractor for all work satisfactorily completed prior to such termination and for any additional costs reasonably incurred in connection with such early termination. If it should be determined that the Owner has improperly terminated the Agreement for default as provided in Section 17.2.1, such termination shall be deemed to be for the Owner's convenience.

17.2.4 Applicable limitations of liability, if any, shall be set forth in the Agreement, Section E.

17.3 ORDER OF PRECEDENCE

In the event of a conflict between these terms and conditions and the **SPECIFICATIONS**, Section D of the IFB, these terms and conditions shall govern. In the event of a conflict between these terms and conditions and the Massachusetts General Laws, the Massachusetts General Laws shall govern. Provided however, the Contractor shall notify the Owner in advance of any known or suspected conflicts, it being understood that the Contractor is deemed to be an expert in the Work and shall have a duty to identify any discrepancies which should be apparent or known to a contractor with performing similar services.

APPENDIX A

SUPPLEMENTARY TERMS AND CONDITIONS

The Contract Documents shall be deemed to include the following provisions and any other provisions applicable to the Work that are required by law, as may be amended from time to time:

M. G.L. c. 30, § 39F

(1) Every contract awarded pursuant to sections forty-four A to L, inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be

included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct

payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor

seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g) and (h).

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to subparagraph (f) of paragraph (1) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) "Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (a) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon

which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction.

M.G.L. 30, § 39G

Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event

be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one per cent retainage, if held by the awarding authority, on that work, including the quantity, price and all but one per cent retainage, if held by the awarding authority, for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the

contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the awarding authority, on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the

work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one per cent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

M.G.L. c. 30, § 39H.

Every contract entered into by or on behalf of the commonwealth for the construction, reconstruction or alteration of a public way shall contain a provision whereby the commonwealth agrees to indemnify the contractor against loss by reason of the liability to pay damages to others for entry upon any land included within the boundaries of the area within which the work is to be performed as set forth in the construction contract and the plans and specifications applying to such contract or any approved alteration thereof or for damage sustained upon any lands adjoining said land by reason of the flowage

or drainage of water thereto or therefrom, in any case wherein such damages result from the failure of the commonwealth to take an interest or easement in such adjoining area, provided that the commonwealth acting by an authorized representative thereof, has issued a notice in writing to the contractor prior to the making of an entry upon such premises directing or permitting him to proceed with his contract and to make such entry upon the premises for the purpose of performing the work required by said contract, or any approved alteration thereof, and provided, further, that the contractor has given notice in writing to the contracting authority within fifteen days after receiving notice of any claim to come in and settle the same and upon the commencement of any action against him to come in and defend said action, but in no event shall any such damage claim be compromised or adjusted without the written consent of the commonwealth. The provisions of this section shall in no way relieve the contractor from any liability for damage to property of others caused by his negligence or that of his employees nor shall they be construed to require the commonwealth to indemnify the contractor against any loss resulting from such acts of negligence.

M.G.L. c. 30, § 39I

Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No wilful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has

been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section wilfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

M.G.L. c. 30, § 39J

Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law.

M.G.L. c. 30, § 39K

Every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, shall contain the following paragraph:— Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in

writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five per cent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one per cent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate than charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the

awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by

certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149.

M.G.L. c. 30, § 39L

The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a contract for the work with, and shall not approve as a subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with the awarding authority a certificate of the state secretary stating that the corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth.

M.G.L. c. 30, § 39N

Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be

delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

M.G.L. c. 30, § 39O

Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

M.G.L. 30, § 39P

Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made.

SECTION I

PREVAILING WAGE SCHEDULE

FAQ's AND BID SUBMITTAL CHECKLIST

I. FAQ's – Do's and Don'ts of Public Bidding*

1. This IFB is issued under G.L. c. 30, § 39M. The competitive bidding statutes are intended to: (1) to enable an awarding authority to obtain the lowest price for its work that competition among responsible contractors can secure; and (2) to establish an honest and open procedure for public contract competition, so that all bidders are on an equal footing in the competition to gain the contract. *See Interstate Engineering Corp. v. Fitchburg*, 367 Mass. 751, 7578 (1975). It is the view of the court and the Massachusetts Attorney General's Office that project bidding specifications, in conjunction with the competitive bidding statute, maintain equal footing among bidders by establishing uniform ground rules for competition for a particular project. Although obtaining the lowest price is the one of the main goals, efforts to do so must be done within the statutory framework, providing for open, honest, and fair competition. Accordingly, the AGO has upheld bid challenges requiring rejection of low bids based on non-compliance and non-conformities of the bid submission.
2. By law, MGED must award the contract to the lowest responsible and eligible bidder. **To be considered “responsible and eligible,” the bid must not include any deviations or exceptions**, although proprietary items may be substituted as permitted by law and the “or equal” clause in Section 2.15 of the General Terms and Conditions (Section H).
3. Pursuant to G.L. c. 30, § 39M, pricing, terms and conditions, and other material aspects of the IFB are **not** negotiable or waivable or subject to discussion with individual bidders. Submitted bids must be unconditional and must conform to the requirements of the IFB. Exceptions may **not** be taken in the bid submission and only may be entertained through the request for clarification/modification process prior to the deadline. By law, MGED only has the authority to waive minor informalities in the submitted bids, which MGED may exercise in its discretion. Change Orders and Modifications to the Specifications, pricing, and contract terms, may be made following the bid award to the extent permitted by law and the Contract Documents.
4. What constitutes a minor informality?

A minor informality or irregularity generally is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a bid or variation of a bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other bidders. For more information, please refer to guidance documents and bid protest decisions issued by the Massachusetts Attorney General, Bid Unit.
5. If a bid contains a minor informality, must the bid be accepted?

No. The awarding authority only has the discretion to waive a minor informality.

6. Is the failure to attach bid security a minor informality?

No. Bid security is a statutory requirement. Failure to include the required bid security renders the bid non-conforming and must be rejected. Such failure is not curable after the deadline for submission of the bids.

7. May the awarding authority award the contract to a more qualified bidder if the bid price is reasonable?

No. The awarding authority must award the contract to the bidder meeting the qualifications listed in the IFB who submits the lowest price based on the rule of award stated in the IFB.

8. May an awarding authority negotiate with a bidder to reduce the price or scope of the construction project?

No, even if the bidder is the only bidder, this is not permitted under the construction bid laws.

9. May a contract be awarded for a price or scope not contained in the bid?

No.

10. Is the “exceptions” method of bidding permissible?

No. The exceptions method allows bidders to modify the scope of the project, and thus, the bidders are not bidding on the same project.

See Maverick v. Leverett, Bid Protest Decision, April 3, 2013.

11. May the bid include clarifications or supplemental information?

No. Only include information specifically requested in the IFB. Bidders are encouraged to seek clarification of the IFB requirements prior to the bid submission deadline.

12. Are post-bid communications/clarifications allowed?

No.

**Some of this information has been obtained from Public Construction Bidding in Massachusetts: Frequently Asked Questions.*

Bidders who are unfamiliar with Massachusetts bid laws for public construction projects and have compliance questions are urged to consult guidance documents and bid protest decisions issued by the Attorney General’s Office. Bidders may ask questions to MGED about the project or bid requirements at the pre-bid meeting or through the pre-submission modification/clarification process.

II. Bid Submittal Checklist

Completed and Signed Bid Form	[]
Appendix A – Bidder Qualification Form	[]
Appendix B – Certificate of Vote (if a corporation)	[]
Resumes and Experience	[]
Copies of Licenses, if applicable	[]
Evidence of Authority to Conduct Business in Massachusetts (if applicable)	[]
Bid Deposit (separate envelope)	[]

***Do NOT submit any information that has not been expressly requested. The submittal of supplemental information, clarifications, deviations, or exceptions to any terms of this IFB will render your bid non-responsive and subject to rejection.**



**THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
Prevailing Wage Rates**

MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

As determined by the Director under the provisions of the
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Ipswich - Electric Light Department **City/Town:** IPSWICH
Contract Number: 25337-TS-001
Description of Work: Installing new yard equipment, foundations, and conduit for substation upgrades.
Job Location: 20 Fowlers Lane

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This annual update requirement is generally not applicable to 27F “rental of equipment” contracts. For such contracts, the prevailing wage rates issued by DLS shall remain in effect for the duration of the contract term. However, if the prevailing wage rate sheet issued does not contain wage rates for each year covered by the contract term, the Awarding Authority must request updated rate sheets from DLS and provide them to the contractor to ensure the correct rates are being paid throughout the duration of the contract. Additionally, if an Awarding Authority exercises an option to renew or extend the contract term, they must request updated rate sheets from DLS and provide them to the contractor.
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT	6/1/2026	\$41.95	\$16.17	\$21.78	\$0.00	\$0.00	\$79.90
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$41.95	\$16.17	\$23.52	\$0.00	\$0.00	\$81.64
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$41.95	\$16.77	\$23.52	\$0.00	\$0.00	\$82.24
(3 AXLE) DRIVER - EQUIPMENT	6/1/2026	\$42.02	\$16.17	\$21.78	\$0.00	\$0.00	\$79.97
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$42.02	\$16.17	\$23.52	\$0.00	\$0.00	\$81.71
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$42.02	\$16.77	\$23.52	\$0.00	\$0.00	\$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT	6/1/2026	\$42.14	\$16.17	\$21.78	\$0.00	\$0.00	\$80.09
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$42.14	\$16.17	\$23.52	\$0.00	\$0.00	\$81.83
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$42.14	\$16.77	\$23.52	\$0.00	\$0.00	\$82.43
ADS/SUBMERSIBLE PILOT	1/1/2024	\$117.16	\$10.08	\$11.62	\$12.67	\$0.00	\$151.53
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							
For apprentice rates see "Apprentice- PILE DRIVER"							
AIR TRACK OPERATOR	6/1/2026	\$42.41	\$10.90	\$9.75	\$9.11	\$0.00	\$72.17
LABORERS	12/1/2026	\$43.85	\$10.90	\$9.75	\$9.11	\$0.00	\$73.61
LABORERS - ZONE 2	6/1/2027	\$45.30	\$10.90	\$9.75	\$9.11	\$0.00	\$75.06
	12/1/2027	\$46.75	\$10.90	\$9.75	\$9.11	\$0.00	\$76.51
	6/1/2028	\$48.25	\$10.90	\$9.75	\$9.11	\$0.00	\$78.01
	12/1/2028	\$49.75	\$10.90	\$9.75	\$9.11	\$0.00	\$79.51
For apprentice rates see "Apprentice- LABORER"							
AIR TRACK OPERATOR (HEAVY & HIGHWAY)	6/1/2026	\$42.41	\$10.90	\$9.75	\$9.21	\$0.00	\$72.27
LABORERS	12/1/2026	\$43.85	\$10.90	\$9.75	\$9.21	\$0.00	\$73.71
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASBESTOS REMOVER - PIPE / MECH. EQUIPT.	12/1/2025	\$44.80	\$14.50	\$4.30	\$6.75	\$0.00	\$70.35
HEAT & FROST INSULATORS LOCAL 6							
HEAT & FROST INSULATORS LOCAL 6 (BOSTON)							
ASPHALT RAKER	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
LABORERS - ZONE 2	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01
For apprentice rates see "Apprentice- LABORER"							
ASPHALT RAKER (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE	6/1/2026	\$59.38	\$17.05	\$13.35	\$3.25	\$0.00	\$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.83	\$17.05	\$13.35	\$3.25	\$0.00	\$94.48
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER OPERATING ENGINEERS LOCAL 4	6/1/2026	\$59.38	\$17.05	\$13.35	\$3.25	\$0.00	\$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.83	\$17.05	\$13.35	\$3.25	\$0.00	\$94.48

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

BARCO-TYPE JUMPING TAMPER LABORERS	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS - ZONE 2	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01

For apprentice rates see "Apprentice- LABORER"

BLOCK PAVER, RAMMER / CURB SETTER LABORERS	6/1/2026	\$42.41	\$10.90	\$9.75	\$9.11	\$0.00	\$72.17
LABORERS - ZONE 2	12/1/2026	\$43.85	\$10.90	\$9.75	\$9.11	\$0.00	\$73.61
	6/1/2027	\$45.30	\$10.90	\$9.75	\$9.11	\$0.00	\$75.06
	12/1/2027	\$46.75	\$10.90	\$9.75	\$9.11	\$0.00	\$76.51
	6/1/2028	\$48.25	\$10.90	\$9.75	\$9.11	\$0.00	\$78.01
	12/1/2028	\$49.75	\$10.90	\$9.75	\$9.11	\$0.00	\$79.51

For apprentice rates see "Apprentice- LABORER"

BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS	6/1/2026	\$42.41	\$10.90	\$9.75	\$9.21	\$0.00	\$72.27
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	\$43.85	\$10.90	\$9.75	\$9.21	\$0.00	\$73.71

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

BOILER MAKER BOILERMAKERS LOCAL 29	1/1/2024	\$48.12	\$7.07	\$14.60	\$6.00	\$0.00	\$75.79
BOILERMAKERS LOCAL 29							

Apprentice: BOILER MAKER							
Effective Date: 1/1/2024							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	\$31.28	\$7.07	\$9.32	\$3.90	\$0.00	\$51.57
2	65.00	\$31.28	\$7.07	\$9.32	\$3.90	\$0.00	\$51.57
3	70.00	\$33.68	\$7.07	\$10.03	\$4.20	\$0.00	\$54.98
4	75.00	\$36.09	\$7.07	\$10.74	\$4.50	\$0.00	\$58.40
5	80.00	\$38.50	\$7.07	\$11.45	\$4.80	\$0.00	\$61.82
6	85.00	\$40.90	\$7.07	\$12.18	\$5.10	\$0.00	\$65.25
7	90.00	\$43.31	\$7.07	\$12.88	\$5.40	\$0.00	\$68.66
8	95.00	\$45.71	\$7.07	\$13.62	\$5.70	\$0.00	\$72.10

Apprentice to Journeyworker Ratio: 1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3	2/1/2026	\$67.95	\$12.84	\$15.57	\$8.02	\$0.00	\$104.38
BRICKLAYERS LOCAL 3 (LYNN)	8/1/2026	\$70.15	\$12.84	\$15.57	\$8.02	\$0.00	\$106.58
	2/1/2027	\$71.55	\$12.84	\$15.57	\$8.02	\$0.00	\$107.98

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)							
Effective Date: 2/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$33.98	\$12.84	\$15.57	\$8.02	\$0.00	\$70.41
2	60.00	\$40.77	\$12.84	\$15.57	\$8.02	\$0.00	\$77.20
3	70.00	\$47.57	\$12.84	\$15.57	\$8.02	\$0.00	\$84.00
4	80.00	\$54.36	\$12.84	\$15.57	\$8.02	\$0.00	\$90.79
5	90.00	\$61.16	\$12.84	\$15.57	\$8.02	\$0.00	\$97.59
Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)							
Effective Date: 8/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$35.08	\$12.84	\$15.57	\$8.02	\$0.00	\$71.51
2	60.00	\$42.09	\$12.84	\$15.57	\$8.02	\$0.00	\$78.52
3	70.00	\$49.11	\$12.84	\$15.57	\$8.02	\$0.00	\$85.54
4	80.00	\$56.12	\$12.84	\$15.57	\$8.02	\$0.00	\$92.55
5	90.00	\$63.14	\$12.84	\$15.57	\$8.02	\$0.00	\$99.57
Apprentice to Journeyworker Ratio: 1:5							
BULLDOZER/GRADER/SCRAPER	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS	6/1/2026	\$50.40	\$10.90	\$9.75	\$9.80	\$0.00	\$80.85
LABORERS - FOUNDATION AND MARINE	12/1/2026	\$51.90	\$10.90	\$9.75	\$9.80	\$0.00	\$82.35
LABORERS - FOUNDATION AND MARINE							
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS	6/1/2026	\$49.25	\$10.90	\$9.75	\$9.80	\$0.00	\$79.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	\$50.75	\$10.90	\$9.75	\$9.80	\$0.00	\$81.20
LABORERS - FOUNDATION AND MARINE							
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS	6/1/2026	\$49.58	\$10.90	\$9.75	\$9.80	\$0.00	\$80.03
LABORERS - FOUNDATION AND MARINE	12/1/2026	\$51.08	\$10.90	\$9.75	\$9.80	\$0.00	\$81.53
LABORERS - FOUNDATION AND MARINE							
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR LABORERS	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS - ZONE 2	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
LABORERS - ZONE 2	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
LABORERS - ZONE 2	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
LABORERS - ZONE 2	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
LABORERS - ZONE 2	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER	3/1/2026	\$50.85	\$11.08	\$11.47	\$8.50	\$0.00	\$81.90
CARPENTERS	9/1/2026	\$52.10	\$11.08	\$11.47	\$8.50	\$0.00	\$83.15
CARPENTERS -ZONE 2 (Eastern Massachusetts)	3/1/2027	\$53.35	\$11.08	\$11.47	\$8.50	\$0.00	\$84.40

Apprentice: CARPENTER							
Effective Date: 3/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	\$22.88	\$11.08	\$0.00	\$1.73	\$0.00	\$35.69
2	45.00	\$22.88	\$11.08	\$0.00	\$1.73	\$0.00	\$35.69
3	55.00	\$27.97	\$11.08	\$0.00	\$3.40	\$0.00	\$42.45
4	55.00	\$27.97	\$11.08	\$0.00	\$3.40	\$0.00	\$42.45
5	70.00	\$35.60	\$11.08	\$11.41	\$5.10	\$0.00	\$63.19
6	70.00	\$35.60	\$11.08	\$11.41	\$5.10	\$0.00	\$63.19
7	80.00	\$40.68	\$11.08	\$11.44	\$6.80	\$0.00	\$70.00
8	80.00	\$40.68	\$11.08	\$11.44	\$6.80	\$0.00	\$70.00

Apprentice: CARPENTER							
Effective Date: 9/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	\$23.45	\$11.08	\$0.00	\$1.73	\$0.00	\$36.26
2	45.00	\$23.45	\$11.08	\$0.00	\$1.73	\$0.00	\$36.26
3	55.00	\$28.66	\$11.08	\$0.00	\$3.40	\$0.00	\$43.14
4	55.00	\$28.66	\$11.08	\$0.00	\$3.40	\$0.00	\$43.14
5	70.00	\$36.47	\$11.08	\$11.41	\$5.10	\$0.00	\$64.06
6	70.00	\$36.47	\$11.08	\$11.41	\$5.10	\$0.00	\$64.06
7	80.00	\$41.68	\$11.08	\$11.44	\$6.80	\$0.00	\$71.00
8	80.00	\$41.68	\$11.08	\$11.44	\$6.80	\$0.00	\$71.00

Apprentice to Journeyworker Ratio: 1:5

CARPENTER WOOD FRAME	10/1/2025	\$27.37	\$7.38	\$4.47	\$1.00	\$0.00	\$40.22
CARPENTERS	10/1/2026	\$28.47	\$7.38	\$4.47	\$1.00	\$0.00	\$41.32

All Aspects of New Wood Frame Work

Apprentice: CARPENTER WOOD FRAME							
Effective Date: 10/1/2025							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	\$16.42	\$7.38	\$0.00	\$0.00	\$0.00	\$23.80
2	60.00	\$16.42	\$7.38	\$0.00	\$0.00	\$0.00	\$23.80
3	65.00	\$17.79	\$7.38	\$0.00	\$1.00	\$0.00	\$26.17
4	70.00	\$19.16	\$7.38	\$0.00	\$1.00	\$0.00	\$27.54
5	75.00	\$20.53	\$7.38	\$3.80	\$1.00	\$0.00	\$32.71
6	80.00	\$21.90	\$7.38	\$3.80	\$1.00	\$0.00	\$34.08

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DEMO: ADZEMAN LABORERS	6/1/2026	\$49.30	\$10.90	\$9.75	\$9.65	\$0.00	\$79.60
LABORERS - ZONE 2	12/7/2026	\$50.80	\$10.90	\$9.75	\$9.65	\$0.00	\$81.10
	6/7/2027	\$52.40	\$10.90	\$9.75	\$9.65	\$0.00	\$82.70
	12/6/2027	\$54.00	\$10.90	\$9.75	\$9.65	\$0.00	\$84.30
	6/5/2028	\$55.68	\$10.90	\$9.75	\$9.65	\$0.00	\$85.98
	12/4/2028	\$57.35	\$10.90	\$9.75	\$9.65	\$0.00	\$87.65

For apprentice rates see "Apprentice- LABORER"

DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS	6/1/2026	\$50.30	\$10.90	\$9.75	\$9.65	\$0.00	\$80.60
LABORERS - ZONE 2	12/7/2026	\$51.80	\$10.90	\$9.75	\$9.65	\$0.00	\$82.10
	6/7/2027	\$53.40	\$10.90	\$9.75	\$9.65	\$0.00	\$83.70
	12/6/2027	\$55.00	\$10.90	\$9.75	\$9.65	\$0.00	\$85.30
	6/5/2028	\$56.68	\$10.90	\$9.75	\$9.65	\$0.00	\$86.98
	12/4/2028	\$58.35	\$10.90	\$9.75	\$9.65	\$0.00	\$88.65

For apprentice rates see "Apprentice- LABORER"

DEMO: BURNERS LABORERS	6/1/2026	\$50.05	\$10.90	\$9.75	\$9.65	\$0.00	\$80.35
LABORERS - ZONE 2	12/7/2026	\$51.55	\$10.90	\$9.75	\$9.65	\$0.00	\$81.85
	6/7/2027	\$53.15	\$10.90	\$9.75	\$9.65	\$0.00	\$83.45
	12/6/2027	\$54.75	\$10.90	\$9.75	\$9.65	\$0.00	\$85.05
	6/5/2028	\$56.43	\$10.90	\$9.75	\$9.65	\$0.00	\$86.73
	12/4/2028	\$58.10	\$10.90	\$9.75	\$9.65	\$0.00	\$88.40

For apprentice rates see "Apprentice- LABORER"

DEMO: CONCRETE CUTTER/SAWYER LABORERS	6/1/2026	\$50.30	\$10.90	\$9.75	\$9.65	\$0.00	\$80.60
LABORERS - ZONE 2	12/7/2026	\$51.80	\$10.90	\$9.75	\$9.65	\$0.00	\$82.10
	6/7/2027	\$53.40	\$10.90	\$9.75	\$9.65	\$0.00	\$83.70
	12/6/2027	\$55.00	\$10.90	\$9.75	\$9.65	\$0.00	\$85.30
	6/5/2028	\$56.68	\$10.90	\$9.75	\$9.65	\$0.00	\$86.98
	12/4/2028	\$58.35	\$10.90	\$9.75	\$9.65	\$0.00	\$88.65

For apprentice rates see "Apprentice- LABORER"

DEMO: JACKHAMMER OPERATOR LABORERS	6/1/2026	\$50.05	\$10.90	\$9.75	\$9.65	\$0.00	\$80.35
LABORERS - ZONE 2	12/7/2026	\$51.55	\$10.90	\$9.75	\$9.65	\$0.00	\$81.85
	6/7/2027	\$53.15	\$10.90	\$9.75	\$9.65	\$0.00	\$83.45
	12/6/2027	\$54.75	\$10.90	\$9.75	\$9.65	\$0.00	\$85.05
	6/5/2028	\$56.43	\$10.90	\$9.75	\$9.65	\$0.00	\$86.73
	12/4/2028	\$58.10	\$10.90	\$9.75	\$9.65	\$0.00	\$88.40

For apprentice rates see "Apprentice- LABORER"

DEMO: WRECKING LABORER LABORERS	6/1/2026	\$49.30	\$10.90	\$9.75	\$9.65	\$0.00	\$79.60
LABORERS - ZONE 2	12/7/2026	\$50.80	\$10.90	\$9.75	\$9.65	\$0.00	\$81.10
	6/7/2027	\$52.40	\$10.90	\$9.75	\$9.65	\$0.00	\$82.70
	12/6/2027	\$54.00	\$10.90	\$9.75	\$9.65	\$0.00	\$84.30
	6/5/2028	\$55.68	\$10.90	\$9.75	\$9.65	\$0.00	\$85.98
	12/4/2028	\$57.35	\$10.90	\$9.75	\$9.65	\$0.00	\$87.65

For apprentice rates see "Apprentice- LABORER"

DIRECTIONAL DRILL MACHINE OPERATOR OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	\$78.11	\$10.08	\$11.62	\$10.04	\$0.00	\$109.85
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A \$69.83, 3A \$91.79,4A \$102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	\$55.79	\$10.08	\$11.62	\$12.67	\$0.00	\$90.16
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A \$54.20, 3A \$73.93,4A \$82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	\$83.69	\$10.08	\$11.62	\$12.67	\$0.00	\$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	\$117.16	\$10.08	\$11.62	\$12.67	\$0.00	\$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	\$26.77	\$6.67	\$3.93	\$0.00	\$0.16	\$37.53
ELECTRICIAN ELECTRICIANS LOCAL 103 ELECTRICIANS LOCAL 103	3/1/2026	\$66.86	\$13.00	\$14.64	\$9.00	\$0.00	\$103.50
	9/1/2026	\$68.78	\$13.00	\$14.69	\$9.00	\$0.00	\$105.47
	3/1/2027	\$69.97	\$13.00	\$14.73	\$9.00	\$0.00	\$106.70
	9/1/2027	\$71.88	\$13.00	\$14.79	\$9.00	\$0.00	\$108.67
	3/1/2028	\$73.08	\$13.00	\$14.82	\$9.00	\$0.00	\$109.90

Apprentice: ELECTRICIAN							
Effective Date: 3/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	\$26.74	\$13.00	\$0.80	\$0.00	\$0.00	\$40.54
2	40.00	\$26.74	\$13.00	\$0.80	\$0.00	\$0.00	\$40.54
3	45.00	\$30.09	\$13.00	\$13.53	\$4.05	\$0.00	\$60.67
4	45.00	\$30.09	\$13.00	\$13.53	\$4.05	\$0.00	\$60.67
5	50.00	\$33.43	\$13.00	\$13.63	\$4.50	\$0.00	\$64.56
6	55.00	\$36.77	\$13.00	\$13.73	\$4.95	\$0.00	\$68.45
7	60.00	\$40.12	\$13.00	\$13.83	\$5.40	\$0.00	\$72.35
8	65.00	\$43.46	\$13.00	\$13.93	\$5.85	\$0.00	\$76.24
9	70.00	\$46.80	\$13.00	\$14.03	\$6.30	\$0.00	\$80.13
10	75.00	\$50.15	\$13.00	\$14.13	\$6.75	\$0.00	\$84.03

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELEVATOR CONSTRUCTOR HELPER	1/1/2026	\$54.08	\$16.38	\$11.06	\$10.07	\$0.00	\$91.59
ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2027	\$56.39	\$16.48	\$11.16	\$11.00	\$0.00	\$95.03
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	5/1/2026	\$54.40	\$16.55	\$13.35	\$3.25	\$0.00	\$87.55
OPERATING ENGINEERS LOCAL 4	11/1/2026	\$55.69	\$16.55	\$13.35	\$3.25	\$0.00	\$88.84
OPERATING ENGINEERS LOCAL 4	5/1/2027	\$57.12	\$16.55	\$13.35	\$3.25	\$0.00	\$90.27
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	5/1/2026	\$56.02	\$16.55	\$13.35	\$3.25	\$0.00	\$89.17
OPERATING ENGINEERS LOCAL 4	11/1/2026	\$57.32	\$16.55	\$13.35	\$3.25	\$0.00	\$90.47
OPERATING ENGINEERS LOCAL 4	5/1/2027	\$58.77	\$16.55	\$13.35	\$3.25	\$0.00	\$91.92
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	5/1/2026	\$26.28	\$16.55	\$13.35	\$3.25	\$0.00	\$59.43
OPERATING ENGINEERS LOCAL 4	11/1/2026	\$27.04	\$16.55	\$13.35	\$3.25	\$0.00	\$60.19
OPERATING ENGINEERS LOCAL 4	5/1/2027	\$27.89	\$16.55	\$13.35	\$3.25	\$0.00	\$61.04
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIRE ALARM INSTALLER	3/1/2026	\$66.86	\$13.00	\$14.64	\$9.00	\$0.00	\$103.50
ELECTRICIANS LOCAL 103	9/1/2026	\$68.78	\$13.00	\$14.69	\$9.00	\$0.00	\$105.47
ELECTRICIANS LOCAL 103	3/1/2027	\$69.97	\$13.00	\$14.73	\$9.00	\$0.00	\$106.70
	9/1/2027	\$71.88	\$13.00	\$14.79	\$9.00	\$0.00	\$108.67
	3/1/2028	\$73.08	\$13.00	\$14.82	\$9.00	\$0.00	\$109.90
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING	3/1/2026	\$53.49	\$13.00	\$14.23	\$7.20	\$0.00	\$87.92
ELECTRICIANS LOCAL 103	9/1/2026	\$55.02	\$13.00	\$14.28	\$7.20	\$0.00	\$89.50
ELECTRICIANS LOCAL 103	3/1/2027	\$55.98	\$13.00	\$14.31	\$7.20	\$0.00	\$90.49
	9/1/2027	\$57.50	\$13.00	\$14.36	\$7.20	\$0.00	\$92.06
	3/1/2028	\$58.46	\$13.00	\$14.38	\$7.20	\$0.00	\$93.04
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN (ASST. ENGINEER)	6/1/2026	\$47.55	\$17.05	\$13.35	\$3.25	\$0.00	\$81.20
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$48.73	\$17.05	\$13.35	\$3.25	\$0.00	\$82.38
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	6/1/2026	\$29.21	\$10.90	\$9.75	\$9.21	\$0.00	\$59.07
LABORERS	12/1/2026	\$29.21	\$10.90	\$9.75	\$9.21	\$0.00	\$59.07
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FLOORCOVERER	3/1/2026	\$59.24	\$10.33	\$11.47	\$8.80	\$0.00	\$89.84
FLOORCOVERERS LOCAL 2168	9/1/2026	\$60.74	\$10.33	\$11.47	\$8.80	\$0.00	\$91.34
FLOORCOVERERS LOCAL 2168 ZONE I	3/1/2027	\$62.24	\$10.33	\$11.47	\$8.80	\$0.00	\$92.84

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - A	2/1/2026	\$62.93	\$14.91	\$18.74	\$9.53	\$2.98	\$109.09
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103 ELECTRICIANS LOCAL 103	3/1/2026	\$66.86	\$13.00	\$14.64	\$9.00	\$0.00	\$103.50
	9/1/2026	\$68.78	\$13.00	\$14.69	\$9.00	\$0.00	\$105.47
	3/1/2027	\$69.97	\$13.00	\$14.73	\$9.00	\$0.00	\$106.70
	9/1/2027	\$71.88	\$13.00	\$14.79	\$9.00	\$0.00	\$108.67
	3/1/2028	\$73.08	\$13.00	\$14.82	\$9.00	\$0.00	\$109.90
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - A	2/1/2026	\$62.93	\$14.91	\$18.74	\$9.53	\$2.98	\$109.09
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER) PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	3/1/2026	\$70.58	\$13.95	\$14.00	\$9.55	\$0.00	\$108.08
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	3/1/2026	\$70.58	\$13.95	\$14.00	\$9.55	\$0.00	\$108.08
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS LABORERS LABORERS - ZONE 2	6/1/2026	\$42.41	\$10.90	\$9.75	\$9.11	\$0.00	\$72.17
	12/1/2026	\$43.85	\$10.90	\$9.75	\$9.11	\$0.00	\$73.61
	6/1/2027	\$45.30	\$10.90	\$9.75	\$9.11	\$0.00	\$75.06
	12/1/2027	\$46.75	\$10.90	\$9.75	\$9.11	\$0.00	\$76.51
	6/1/2028	\$48.25	\$10.90	\$9.75	\$9.11	\$0.00	\$78.01
	12/1/2028	\$49.75	\$10.90	\$9.75	\$9.11	\$0.00	\$79.51
For apprentice rates see "Apprentice- LABORER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	\$42.41	\$10.90	\$9.75	\$9.21	\$0.00	\$72.27
	12/1/2026	\$43.85	\$10.90	\$9.75	\$9.21	\$0.00	\$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	9/1/2025	\$60.34	\$14.75	\$9.52	\$10.09	\$0.00	\$94.70
	9/1/2026	\$63.76	\$14.75	\$9.52	\$10.09	\$0.00	\$98.12

Apprentice: INSULATOR (PIPES & TANKS)							
Effective Date: 9/1/2025							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$30.17	\$14.75	\$9.27	\$5.05	\$0.00	\$59.24
2	60.00	\$36.20	\$14.75	\$9.32	\$6.05	\$0.00	\$66.32
3	70.00	\$42.24	\$14.75	\$9.37	\$7.06	\$0.00	\$73.42

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: INSULATOR (PIPES & TANKS)							
Effective Date: 9/1/2025							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
4	80.00	\$48.27	\$14.75	\$9.42	\$8.07	\$0.00	\$80.51

Apprentice: INSULATOR (PIPES & TANKS)							
Effective Date: 9/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$31.88	\$14.75	\$9.27	\$5.05	\$0.00	\$60.95
2	60.00	\$38.26	\$14.75	\$9.32	\$6.05	\$0.00	\$68.38
3	70.00	\$44.63	\$14.75	\$9.37	\$7.06	\$0.00	\$75.81
4	80.00	\$51.01	\$14.75	\$9.42	\$8.07	\$0.00	\$83.25

Apprentice to Journeyworker Ratio: 1:4

IRONWORKER/WELDER IRONWORKERS LOCAL 7 IRONWORKERS LOCAL 7 (LAWRENCE AREA)	9/16/2025	\$53.46	\$9.05	\$12.75	\$14.50	\$0.00	\$89.76
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Apprentice: IRONWORKER/WELDER							
Effective Date: 9/16/2025							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	\$32.08	\$9.05	\$12.75	\$4.50	\$0.00	\$58.38
2	75.00	\$40.10	\$9.05	\$12.75	\$4.50	\$0.00	\$66.40
3	85.00	\$45.44	\$9.05	\$12.75	\$4.50	\$0.00	\$71.74
4	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
5	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Apprentice to Journeyworker Ratio: 1:4

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS - ZONE 2	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01

For apprentice rates see "Apprentice- LABORER"

LABORER	6/1/2026	\$41.66	\$10.90	\$9.75	\$9.11	\$0.00	\$71.42
LABORERS	12/1/2026	\$43.10	\$10.90	\$9.75	\$9.11	\$0.00	\$72.86
LABORERS - ZONE 2	6/1/2027	\$44.55	\$10.90	\$9.75	\$9.11	\$0.00	\$74.31
	12/1/2027	\$46.00	\$10.90	\$9.75	\$9.11	\$0.00	\$75.76
	6/1/2028	\$47.50	\$10.90	\$9.75	\$9.11	\$0.00	\$77.26
	12/1/2028	\$49.00	\$10.90	\$9.75	\$9.11	\$0.00	\$78.76

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS	12/1/2026	\$43.10	\$10.90	\$9.75	\$9.11	\$0.00	\$72.86
LABORERS - ZONE 2	6/1/2027	\$44.55	\$10.90	\$9.75	\$9.11	\$0.00	\$74.31
	12/1/2027	\$46.00	\$10.90	\$9.75	\$9.11	\$0.00	\$75.76
	6/1/2028	\$47.50	\$10.90	\$9.75	\$9.11	\$0.00	\$77.26
	12/1/2028	\$49.00	\$10.90	\$9.75	\$9.11	\$0.00	\$78.76

For apprentice rates see "Apprentice- LABORER"

LABORER: CEMENT FINISHER TENDER	6/1/2026	\$41.66	\$10.90	\$9.75	\$9.11	\$0.00	\$71.42
LABORERS	12/1/2026	\$43.10	\$10.90	\$9.75	\$9.11	\$0.00	\$72.86
LABORERS - ZONE 2	6/1/2027	\$44.55	\$10.90	\$9.75	\$9.11	\$0.00	\$74.31
	12/1/2027	\$46.00	\$10.90	\$9.75	\$9.11	\$0.00	\$75.76
	6/1/2028	\$47.50	\$10.90	\$9.75	\$9.11	\$0.00	\$77.26
	12/1/2028	\$49.00	\$10.90	\$9.75	\$9.11	\$0.00	\$78.76

For apprentice rates see "Apprentice- LABORER"

LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	6/1/2026	\$41.75	\$10.90	\$9.75	\$9.65	\$0.00	\$72.05
LABORERS	12/7/2026	\$43.19	\$10.90	\$9.75	\$9.65	\$0.00	\$73.49
LABORERS - ZONE 2	6/7/2027	\$44.64	\$10.90	\$9.75	\$9.65	\$0.00	\$74.94
	12/6/2027	\$46.09	\$10.90	\$9.75	\$9.65	\$0.00	\$76.39
	6/5/2028	\$47.59	\$10.90	\$9.75	\$9.65	\$0.00	\$77.89
	12/4/2028	\$49.09	\$10.90	\$9.75	\$9.65	\$0.00	\$79.39

For apprentice rates see "Apprentice- LABORER"

LABORER: MASON TENDER	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
LABORERS - ZONE 2	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01

For apprentice rates see "Apprentice- LABORER"

LABORER: MASON TENDER (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

LABORER: MULTI-TRADE TENDER	6/1/2026	\$41.66	\$10.90	\$9.75	\$9.11	\$0.00	\$71.42
LABORERS	12/1/2026	\$43.10	\$10.90	\$9.75	\$9.11	\$0.00	\$72.86
LABORERS - ZONE 2	6/1/2027	\$44.55	\$10.90	\$9.75	\$9.11	\$0.00	\$74.31
	12/1/2027	\$46.00	\$10.90	\$9.75	\$9.11	\$0.00	\$75.76
	6/1/2028	\$47.50	\$10.90	\$9.75	\$9.11	\$0.00	\$77.26
	12/1/2028	\$49.00	\$10.90	\$9.75	\$9.11	\$0.00	\$78.76

For apprentice rates see "Apprentice- LABORER"

LABORER: TREE REMOVER	6/1/2026	\$41.66	\$10.90	\$9.75	\$9.11	\$0.00	\$71.42
LABORERS	12/1/2026	\$43.10	\$10.90	\$9.75	\$9.11	\$0.00	\$72.86
LABORERS - ZONE 2	6/1/2027	\$44.55	\$10.90	\$9.75	\$9.11	\$0.00	\$74.31
	12/1/2027	\$46.00	\$10.90	\$9.75	\$9.11	\$0.00	\$75.76
	6/1/2028	\$47.50	\$10.90	\$9.75	\$9.11	\$0.00	\$77.26
	12/1/2028	\$49.00	\$10.90	\$9.75	\$9.11	\$0.00	\$78.76

This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
incidental to construction . For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
LABORERS - ZONE 2	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01

For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

MARBLE & TILE FINISHERS	2/1/2026	\$52.08	\$12.84	\$15.57	\$5.78	\$0.00	\$86.27
BRICKLAYERS LOCAL 3	8/1/2026	\$53.84	\$12.84	\$15.57	\$5.78	\$0.00	\$88.03
BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2027	\$54.96	\$12.84	\$15.57	\$5.78	\$0.00	\$89.15

Apprentice: MARBLE & TILE FINISHERS							
Effective Date: 2/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$26.04	\$12.84	\$15.57	\$5.78	\$0.00	\$60.23
2	60.00	\$31.25	\$12.84	\$15.57	\$5.78	\$0.00	\$65.44
3	70.00	\$36.46	\$12.84	\$15.57	\$5.78	\$0.00	\$70.65
4	80.00	\$41.66	\$12.84	\$15.57	\$5.78	\$0.00	\$75.85
5	90.00	\$46.87	\$12.84	\$15.57	\$5.78	\$0.00	\$81.06

Apprentice: MARBLE & TILE FINISHERS							
Effective Date: 8/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$26.92	\$12.84	\$15.57	\$5.78	\$0.00	\$61.11
2	60.00	\$32.30	\$12.84	\$15.57	\$5.78	\$0.00	\$66.49
3	70.00	\$37.69	\$12.84	\$15.57	\$5.78	\$0.00	\$71.88
4	80.00	\$43.07	\$12.84	\$15.57	\$5.78	\$0.00	\$77.26
5	90.00	\$48.46	\$12.84	\$15.57	\$5.78	\$0.00	\$82.65

Apprentice to Journeyworker Ratio: 1:5

MARBLE MASONS, TILELAYERS & TERRAZZO MECH	2/1/2026	\$67.97	\$12.84	\$15.57	\$7.99	\$0.00	\$104.37
BRICKLAYERS LOCAL 3	8/1/2026	\$70.17	\$12.84	\$15.57	\$7.99	\$0.00	\$106.57
BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2027	\$71.57	\$12.84	\$15.57	\$7.99	\$0.00	\$107.97

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
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Apprentice Notes
 Step 1&2 Appr. indentured after 1/6/2020 receive no pension,

Apprentice to Journeyworker Ratio: 1:4

MORTAR MIXER LABORERS	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS - ZONE 2	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01

For apprentice rates see "Apprentice- LABORER"

OILER (OTHER THAN TRUCK CRANES,GRADALLS)	6/1/2026	\$25.07	\$17.05	\$13.35	\$3.25	\$0.00	\$58.72
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$25.74	\$17.05	\$13.35	\$3.25	\$0.00	\$59.39

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OILER (TRUCK CRANES, GRADALLS)	6/1/2026	\$31.17	\$17.05	\$13.35	\$3.25	\$0.00	\$64.82
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$31.97	\$17.05	\$13.35	\$3.25	\$0.00	\$65.62

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OTHER POWER DRIVEN EQUIPMENT - CLASS II	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS)	1/1/2026	\$59.56	\$10.35	\$12.00	\$12.50	\$0.00	\$94.41
PAINTERS LOCAL 35							
PAINTERS LOCAL 35 - ZONE 2							

Apprentice: PAINTER (BRIDGES/TANKS)
Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$29.78	\$10.35	\$0.00	\$0.00	\$0.00	\$40.13
2	55.00	\$32.76	\$10.35	\$0.00	\$6.93	\$0.00	\$50.04
3	60.00	\$35.74	\$10.35	\$0.00	\$7.56	\$0.00	\$53.65
4	65.00	\$38.71	\$10.35	\$0.00	\$8.19	\$0.00	\$57.25
5	70.00	\$41.69	\$10.35	\$12.00	\$8.82	\$0.00	\$72.86
6	75.00	\$44.67	\$10.35	\$12.00	\$9.45	\$0.00	\$76.47
7	80.00	\$47.65	\$10.35	\$12.00	\$10.08	\$0.00	\$80.08
8	90.00	\$53.60	\$10.35	\$12.00	\$11.34	\$0.00	\$87.29

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	1/1/2026	\$50.46	\$10.35	\$12.00	\$12.60	\$0.00	\$85.41
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* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.

PAINTERS LOCAL 35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PAINTER / TAPER (BRUSH, NEW) *							
Effective Date: 1/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	60.00	\$29.44	\$10.35	\$0.00	\$7.56	\$0.00	\$47.35
4	65.00	\$31.89	\$10.35	\$0.00	\$8.19	\$0.00	\$50.43
5	70.00	\$34.34	\$10.35	\$12.00	\$8.82	\$0.00	\$65.51
6	75.00	\$36.80	\$10.35	\$12.00	\$9.45	\$0.00	\$68.60
7	80.00	\$39.25	\$10.35	\$12.00	\$10.08	\$0.00	\$71.68
8	90.00	\$44.15	\$10.35	\$12.00	\$11.34	\$0.00	\$77.84
Apprentice to Journeyworker Ratio: 1:1							

PAINTER / TAPER (BRUSH, REPAINT)	1/1/2026	\$47.12	\$10.35	\$12.00	\$12.60	\$0.00	\$82.07
PAINTERS LOCAL 35							
PAINTERS LOCAL 35 - ZONE 2							

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)							
Effective Date: 1/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$23.56	\$10.35	\$0.00	\$0.00	\$0.00	\$33.91
2	55.00	\$25.92	\$10.35	\$0.00	\$6.93	\$0.00	\$43.20
3	60.00	\$28.27	\$10.35	\$0.00	\$7.56	\$0.00	\$46.18
4	65.00	\$30.63	\$10.35	\$0.00	\$8.19	\$0.00	\$49.17
5	70.00	\$32.98	\$10.35	\$12.00	\$8.82	\$0.00	\$64.15
6	75.00	\$35.34	\$10.35	\$12.00	\$9.45	\$0.00	\$67.14
7	80.00	\$37.70	\$10.35	\$12.00	\$10.08	\$0.00	\$70.13
8	90.00	\$42.41	\$10.35	\$12.00	\$11.34	\$0.00	\$76.10

Apprentice to Journeyworker Ratio: 1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	6/1/2026	\$41.66	\$10.90	\$9.75	\$9.21	\$0.00	\$71.52
LABORERS	12/1/2026	\$43.10	\$10.90	\$9.75	\$9.21	\$0.00	\$72.96
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							

PANEL & PICKUP TRUCKS DRIVER	6/1/2026	\$41.78	\$16.17	\$21.78	\$0.00	\$0.00	\$79.73
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$41.78	\$16.17	\$23.52	\$0.00	\$0.00	\$81.47
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$41.78	\$16.77	\$23.52	\$0.00	\$0.00	\$82.07

PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	8/1/2024	\$55.79	\$10.08	\$11.62	\$12.67	\$0.00	\$90.16
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							
For apprentice rates see "Apprentice- PILE DRIVER"							

PILE DRIVER	8/1/2024	\$55.79	\$10.08	\$11.62	\$12.67	\$0.00	\$90.16
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PILE DRIVER							
Effective Date: 8/1/2024							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	\$25.11	\$10.08	\$0.00	\$2.53	\$0.00	\$37.72
2	55.00	\$30.68	\$10.08	\$0.00	\$5.07	\$0.00	\$45.83
3	70.00	\$39.05	\$10.08	\$11.62	\$7.60	\$0.00	\$68.35
4	80.00	\$44.63	\$10.08	\$11.62	\$10.14	\$0.00	\$76.47
Apprentice to Journeyworker Ratio: 1:5							
PIPEFITTER & STEAMFITTER PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	3/1/2026	\$70.58	\$13.95	\$14.00	\$9.55	\$0.00	\$108.08
Apprentice: PIPEFITTER & STEAMFITTER							
Effective Date: 3/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	\$28.23	\$13.95	\$0.30	\$9.55	\$0.00	\$52.03
2	45.00	\$31.76	\$13.95	\$14.00	\$9.55	\$0.00	\$69.26
3	60.00	\$42.35	\$13.95	\$14.00	\$9.55	\$0.00	\$79.85
4	70.00	\$49.41	\$13.95	\$14.00	\$9.55	\$0.00	\$86.91
5	80.00	\$56.46	\$13.95	\$14.00	\$9.55	\$0.00	\$93.96
Apprentice to Journeyworker Ratio: 1:3							
PIPELAYER LABORERS LABORERS - ZONE 2	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBERS & GASFITTERS PLUMBERS & GASFITTERS LOCAL 12 PLUMBERS & GASFITTERS LOCAL 12	3/2/2026	\$72.64	\$15.32	\$12.61	\$8.00	\$0.00	\$108.57
	8/31/2026	\$74.79	\$15.32	\$12.61	\$8.00	\$0.00	\$110.72
	3/1/2027	\$76.94	\$15.32	\$12.61	\$8.00	\$0.00	\$112.87
	8/30/2027	\$79.09	\$15.32	\$12.61	\$8.00	\$0.00	\$115.02
	2/28/2028	\$81.29	\$15.32	\$12.61	\$8.00	\$0.00	\$117.22
	9/4/2028	\$83.49	\$15.32	\$12.61	\$8.00	\$0.00	\$119.42
	3/5/2029	\$85.69	\$15.32	\$12.61	\$8.00	\$0.00	\$121.62
	9/3/2029	\$87.89	\$15.32	\$12.61	\$8.00	\$0.00	\$123.82
	3/4/2030	\$89.84	\$15.32	\$12.61	\$8.00	\$0.00	\$125.77

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PLUMBERS & GASFITTERS							
Effective Date: 3/2/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	35.00	\$25.42	\$15.32	\$4.61	\$2.80	\$0.00	\$48.15
2	40.00	\$29.06	\$15.32	\$5.22	\$3.20	\$0.00	\$52.80
3	55.00	\$39.95	\$15.32	\$7.07	\$4.40	\$0.00	\$66.74
4	65.00	\$47.22	\$15.32	\$8.30	\$5.20	\$0.00	\$76.04
5	75.00	\$54.48	\$15.32	\$9.53	\$6.00	\$0.00	\$85.33
Apprentice: PLUMBERS & GASFITTERS							
Effective Date: 8/31/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	35.00	\$26.18	\$15.32	\$4.61	\$2.80	\$0.00	\$48.91
2	40.00	\$29.92	\$15.32	\$5.22	\$3.20	\$0.00	\$53.66
3	55.00	\$41.13	\$15.32	\$7.07	\$5.20	\$0.00	\$68.72
4	65.00	\$48.61	\$15.32	\$8.30	\$5.20	\$0.00	\$77.43
5	75.00	\$56.09	\$15.32	\$9.53	\$6.00	\$0.00	\$86.94
Apprentice to Journeyworker Ratio: 1:2							
PNEUMATIC CONTROLS (TEMP.)	3/1/2026	\$70.58	\$13.95	\$14.00	\$9.55	\$0.00	\$108.08
PIPEFITTERS LOCAL 537							
PIPEFITTERS LOCAL 537							
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
LABORERS - ZONE 2	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01
For apprentice rates see "Apprentice- LABORER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWDERMAN & BLASTER	6/1/2026	\$42.66	\$10.90	\$9.75	\$9.11	\$0.00	\$72.42
LABORERS	12/1/2026	\$44.10	\$10.90	\$9.75	\$9.11	\$0.00	\$73.86
LABORERS - ZONE 2	6/1/2027	\$45.55	\$10.90	\$9.75	\$9.11	\$0.00	\$75.31
	12/1/2027	\$47.00	\$10.90	\$9.75	\$9.11	\$0.00	\$76.76
	6/1/2028	\$48.50	\$10.90	\$9.75	\$9.11	\$0.00	\$78.26
	12/1/2028	\$50.00	\$10.90	\$9.75	\$9.11	\$0.00	\$79.76
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS	6/1/2026	\$42.66	\$10.90	\$9.75	\$9.21	\$0.00	\$72.52
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	\$44.10	\$10.90	\$9.75	\$9.21	\$0.00	\$73.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWER SHOVEL/DERRICK/TRENCHING MACHINE OPERATING ENGINEERS LOCAL 4	6/1/2026	\$59.38	\$17.05	\$13.35	\$3.25	\$0.00	\$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.83	\$17.05	\$13.35	\$3.25	\$0.00	\$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 4	6/1/2026	\$37.63	\$17.05	\$13.35	\$3.25	\$0.00	\$71.28
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$38.58	\$17.05	\$13.35	\$3.25	\$0.00	\$72.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER TEAMSTERS 42 - J.G. MacLeallan (Wakefield)	5/1/2026	\$30.50	\$12.00	\$7.00	\$0.00	\$0.00	\$49.50
RECLAIMERS OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS - ZONE 2	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01
For apprentice rates see "Apprentice- LABORER"							
ROLLER/SPREADER/MULCHING MACHINE OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg) ROOFERS LOCAL 33	2/1/2026	\$53.53	\$14.53	\$12.67	\$9.03	\$0.00	\$89.76
ROOFERS LOCAL 33							

Apprentice: ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg)							
Effective Date: 2/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$26.77	\$14.53	\$6.52	\$9.03	\$0.00	\$56.85
2	60.00	\$32.12	\$14.53	\$12.67	\$9.03	\$0.00	\$68.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: ROOFER (Inc.Roofing Waterproofing &Roofing Damproofg)							
Effective Date: 2/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	65.00	\$34.79	\$14.53	\$12.67	\$9.03	\$0.00	\$71.02
4	75.00	\$40.15	\$14.53	\$12.67	\$9.03	\$0.00	\$76.38
5	85.00	\$45.50	\$14.53	\$12.67	\$9.03	\$0.00	\$81.73
Apprentice Notes							
** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1							
Apprentice to Journeyworker Ratio: 1:5							
ROOFER SLATE / TILE / PRECAST CONCRETE	2/1/2026	\$53.78	\$14.53	\$12.67	\$9.03	\$0.00	\$90.01
ROOFERS LOCAL 33							
ROOFERS LOCAL 33							
For apprentice rates see "Apprentice- ROOFER"							
SHEETMETAL WORKER	2/1/2026	\$62.93	\$14.91	\$18.74	\$9.53	\$2.98	\$109.09
SHEETMETAL WORKERS LOCAL 17							
SHEETMETAL WORKERS LOCAL 17 - A							
Apprentice: SHEETMETAL WORKER							
Effective Date: 2/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	42.00	\$26.43	\$14.91	\$6.19	\$0.00	\$0.00	\$47.53
2	42.00	\$26.43	\$14.91	\$6.19	\$0.00	\$0.00	\$47.53
3	47.00	\$29.58	\$14.91	\$10.93	\$1.25	\$1.62	\$58.29
4	47.00	\$29.58	\$14.91	\$10.93	\$1.25	\$1.62	\$58.29
5	52.00	\$32.72	\$14.91	\$11.66	\$1.50	\$1.74	\$62.53
6	52.00	\$32.72	\$14.91	\$11.66	\$1.75	\$1.75	\$62.79
7	60.00	\$37.76	\$14.91	\$12.84	\$2.00	\$1.93	\$69.44
8	65.00	\$40.90	\$14.91	\$13.58	\$2.25	\$2.04	\$73.68
9	75.00	\$47.20	\$14.91	\$15.06	\$2.75	\$2.28	\$82.20
10	85.00	\$53.49	\$14.91	\$16.53	\$2.75	\$2.49	\$90.17
Apprentice to Journeyworker Ratio: 1:4							
SPECIALIZED EARTH MOVING EQUIP < 35 TONS	6/1/2026	\$42.24	\$16.17	\$21.78	\$0.00	\$0.00	\$80.19
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$42.24	\$16.17	\$23.52	\$0.00	\$0.00	\$81.93
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$42.24	\$16.77	\$23.52	\$0.00	\$0.00	\$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS	6/1/2026	\$42.53	\$16.17	\$21.78	\$0.00	\$0.00	\$80.48
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$42.53	\$16.17	\$23.52	\$0.00	\$0.00	\$82.22
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$42.53	\$16.77	\$23.52	\$0.00	\$0.00	\$82.82
SPRINKLER FITTER	1/1/2026	\$64.85	\$13.45	\$7.45	\$18.25	\$0.00	\$104.00
SPRINKLER FITTERS LOCAL 550							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2							

Apprentice: SPRINKLER FITTER							
Effective Date: 1/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	\$22.70	\$13.45	\$13.84	\$0.00	\$0.00	\$49.99
2	0.00	\$25.94	\$13.45	\$14.75	\$0.00	\$0.00	\$54.14
3	0.00	\$29.18	\$13.45	\$15.67	\$0.00	\$0.00	\$58.30
4	0.00	\$32.43	\$13.45	\$16.57	\$0.00	\$0.00	\$62.45
5	0.00	\$35.67	\$13.45	\$17.49	\$0.00	\$0.00	\$66.61
6	0.00	\$38.91	\$13.45	\$18.40	\$0.00	\$0.00	\$70.76
7	0.00	\$42.15	\$13.45	\$19.32	\$0.00	\$0.00	\$74.92
8	0.00	\$45.40	\$13.45	\$20.22	\$0.00	\$0.00	\$79.07
9	0.00	\$48.64	\$13.45	\$21.15	\$0.00	\$0.00	\$83.24
10	0.00	\$51.88	\$13.45	\$22.05	\$0.00	\$0.00	\$87.38

Apprentice Notes
 Apprentice entered prior 9/30/10:

Apprentice to Journeyworker Ratio: 1:3

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TELECOMMUNICATION TECHNICIAN	3/1/2026	\$53.49	\$13.00	\$14.23	\$7.20	\$0.00	\$87.92
TELECOMMUNICATION TECHNICIAN	9/1/2026	\$55.02	\$13.00	\$14.28	\$7.20	\$0.00	\$89.50
ELECTRICIANS LOCAL 103	3/1/2027	\$55.98	\$13.00	\$14.31	\$7.20	\$0.00	\$90.49
ELECTRICIANS LOCAL 103	9/1/2027	\$57.50	\$13.00	\$14.36	\$7.20	\$0.00	\$92.06
	3/1/2028	\$58.46	\$13.00	\$14.38	\$7.20	\$0.00	\$93.04

For apprentice rates and ratios see "Apprentice- ELECTRICIAN"

Apprentice: TELECOMMUNICATION TECHNICIAN							
Effective Date: 3/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	\$24.07	\$13.00	\$0.72	\$0.00	\$0.00	\$37.79
2	45.00	\$24.07	\$13.00	\$0.72	\$0.00	\$0.00	\$37.79
3	50.00	\$26.75	\$13.00	\$13.43	\$3.60	\$0.00	\$56.78
4	50.00	\$26.75	\$13.00	\$13.43	\$3.60	\$0.00	\$56.78
5	55.00	\$29.42	\$13.00	\$13.51	\$3.96	\$0.00	\$59.89

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: TERRAZZO FINISHERS							
Effective Date: 8/1/2026							
Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	\$34.55	\$12.84	\$15.57	\$8.02	\$0.00	\$70.98
2	60.00	\$41.45	\$12.84	\$15.57	\$8.02	\$0.00	\$77.88
3	70.00	\$48.36	\$12.84	\$15.57	\$8.02	\$0.00	\$84.79
4	80.00	\$55.27	\$12.84	\$15.57	\$8.02	\$0.00	\$91.70
5	90.00	\$62.18	\$12.84	\$15.57	\$8.02	\$0.00	\$98.61
Apprentice to Journeyworker Ratio: 1:5							
TEST BORING DRILLER LABORERS	6/1/2026	\$53.25	\$10.90	\$9.75	\$9.80	\$0.00	\$83.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	\$54.75	\$10.90	\$9.75	\$9.80	\$0.00	\$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER LABORERS	6/1/2026	\$49.37	\$10.90	\$9.75	\$9.80	\$0.00	\$79.82
LABORERS - FOUNDATION AND MARINE	12/1/2026	\$50.87	\$10.90	\$9.75	\$9.80	\$0.00	\$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER LABORERS	6/1/2026	\$49.25	\$10.90	\$9.75	\$9.80	\$0.00	\$79.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	\$50.75	\$10.90	\$9.75	\$9.80	\$0.00	\$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS/PORTABLE STEAM GENERATORS OPERATING ENGINEERS LOCAL 4	6/1/2026	\$58.70	\$17.05	\$13.35	\$3.25	\$0.00	\$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.14	\$17.05	\$13.35	\$3.25	\$0.00	\$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10	6/1/2026	\$42.82	\$16.17	\$21.78	\$0.00	\$0.00	\$80.77
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2026	\$42.82	\$16.17	\$23.52	\$0.00	\$0.00	\$82.51
	1/1/2027	\$42.82	\$16.77	\$23.52	\$0.00	\$0.00	\$83.11
TUNNEL WORK - COMPRESSED AIR LABORERS	6/1/2026	\$61.48	\$10.90	\$9.75	\$10.25	\$0.00	\$92.38
LABORERS (COMPRESSED AIR)	12/1/2026	\$62.98	\$10.90	\$9.75	\$10.25	\$0.00	\$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) LABORERS	6/1/2026	\$63.48	\$10.90	\$9.75	\$10.25	\$0.00	\$94.38
LABORERS (COMPRESSED AIR)	12/1/2026	\$64.98	\$10.90	\$9.75	\$10.25	\$0.00	\$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR LABORERS	6/1/2026	\$53.55	\$10.90	\$9.75	\$10.25	\$0.00	\$84.45
LABORERS (FREE AIR TUNNEL)	12/1/2026	\$55.05	\$10.90	\$9.75	\$10.25	\$0.00	\$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE) LABORERS	6/1/2026	\$55.55	\$10.90	\$9.75	\$10.25	\$0.00	\$86.45

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS (FREE AIR TUNNEL)	12/1/2026	\$57.05	\$10.90	\$9.75	\$10.25	\$0.00	\$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	6/1/2026	\$42.24	\$16.17	\$21.78	\$0.00	\$0.00	\$80.19
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2026	\$42.24	\$16.17	\$23.52	\$0.00	\$0.00	\$81.93
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2027	\$42.24	\$16.77	\$23.52	\$0.00	\$0.00	\$82.53
WAGON DRILL OPERATOR	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.11	\$0.00	\$71.67
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.11	\$0.00	\$73.11
LABORERS - ZONE 2	6/1/2027	\$44.80	\$10.90	\$9.75	\$9.11	\$0.00	\$74.56
	12/1/2027	\$46.25	\$10.90	\$9.75	\$9.11	\$0.00	\$76.01
	6/1/2028	\$47.75	\$10.90	\$9.75	\$9.11	\$0.00	\$77.51
	12/1/2028	\$49.25	\$10.90	\$9.75	\$9.11	\$0.00	\$79.01
For apprentice rates see "Apprentice- LABORER"							
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2026	\$41.91	\$10.90	\$9.75	\$9.21	\$0.00	\$71.77
LABORERS	12/1/2026	\$43.35	\$10.90	\$9.75	\$9.21	\$0.00	\$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WASTE WATER PUMP OPERATOR	6/1/2026	\$59.38	\$17.05	\$13.35	\$3.25	\$0.00	\$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	\$60.83	\$17.05	\$13.35	\$3.25	\$0.00	\$94.48
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
WATER METER INSTALLER	3/2/2026	\$72.64	\$15.32	\$12.61	\$8.00	\$0.00	\$108.57
PLUMBERS & GASFITTERS LOCAL 12	8/31/2026	\$74.79	\$15.32	\$12.61	\$8.00	\$0.00	\$110.72
PLUMBERS & GASFITTERS LOCAL 12	3/1/2027	\$76.94	\$15.32	\$12.61	\$8.00	\$0.00	\$112.87
	8/30/2027	\$79.09	\$15.32	\$12.61	\$8.00	\$0.00	\$115.02
	2/2/2028	\$81.29	\$15.32	\$12.61	\$8.00	\$0.00	\$117.22
	9/4/2028	\$83.49	\$15.32	\$12.61	\$8.00	\$0.00	\$119.42
	3/5/2029	\$85.69	\$15.32	\$12.61	\$8.00	\$0.00	\$121.62
	9/3/2029	\$87.89	\$15.32	\$12.61	\$8.00	\$0.00	\$123.82
	3/4/2030	\$89.84	\$15.32	\$12.61	\$8.00	\$0.00	\$125.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.