PROJECT MANUAL

FOR

DEPARTMENT OF PUBLIC WORKS TOWN OF WEST SPRINGFIELD, MA

BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT PROJECT NUMBER CWSRF-4513 CONTRACT NUMBER 1 TOWN BID NO. 20-0013

PREPARED BY:

MOTT MACDONALD



TOWN OF WEST SPRINGFIELD BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT CWSRF-4513 Contract No. 1 Town Bid No. 20-0013

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SECTION 00100 BID ADVERTISEMENT

SECTION 00100 BID ADVERTISEMENT BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT CWSRF NO. 4513 CONTRACT NUMBER 1 TOWN BID NO. 20-0013

Sealed Bids for the construction of the **Birnie Avenue/Piper Road Area Sewer Expansion Project** will be received by the West Springfield Department of Public Works at the West Springfield Municipal Office Building, 26 Central Street, West Springfield, MA, 01089, until **2:00 P.M., local time on March 10, 2020** at which time the Bids received will be publicly opened and read in the third floor conference room of the Municipal Office Building.

Sealed Bids must have an outer envelope marked as:

BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT CWSRF No. 4513 CONTRACT NUMBER 1 TOWN BID NO. 20-0013

A copy of the Bidding Documents may be obtained electronically from the Town of West Springfield Procurement Site at:

https://www.townofwestspringfield.org/government/departments/finance/procurement-bids/bids

In order to view or download the bid document on-line, you must pre-register for the project bid you are interested in.

The work includes the furnishing of all labor, materials and equipment necessary to complete the work as shown on the Drawings and as described in the Specifications. This project will include the construction of approximately 17,500 linear feet of 8-inch and 10-inch PVC gravity sewer mains, 2,200 linear feet of 3-inch HDPE sewer force main, 1,300 linear feet of 2-inch PVC low-pressure sewer, sanitary manholes, two pump stations, including electrical and structural work, and other related appurtenant work. Contract duration is 470 calendar days from the Notice to Proceed. Final Completion date for the Project is July 31, 2021. Bids shall be on a unit price basis.

All bids for this project are subject to the provisions of Massachusetts General Laws, Chapter 30, Section 39M as amended.

All Bidders shall furnish with their Bid a bid deposit in the form of a bid bond or a certified check in the amount of 5% of the total amount of the Bid and made payable to the Town of West Springfield, Massachusetts.

This project is funded by a loan from the Massachusetts Clean Water Trust/State Revolving Fund loan program, and Section 00800 contains the applicable funding program construction contract requirements.

The project requires compliance with the Massachusetts Department of Environmental Protection Diesel Retrofit Program by use of after-engine emission controls that are EPA certified, or their equivalent, on all of the off-road (non-registered) diesel vehicles/equipment used at the job site.

Disadvantaged Business Enterprise (DBE) goals are applicable to the total dollars paid to the construction contract. The goals for this project are a minimum of **4.20 percent D/MBE participation and 4.50 percent D/WBE participation by certified DBEs**. The two low bidders shall submit completed DBE forms (EEO-DEP-190C & EEO-DEP-191C and the DBE Certification of United States Citizenship form) by close of business on the third business day after bid opening. Failure to comply with the requirements of this paragraph may be deemed to render a proposal non-responsive. No waiver of any provision of this section will be granted unless approved by the Massachusetts Department of Environmental Protection (MassDEP).

Minimum Wage Rates as determined by the Commissioner of Department of Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27D, as amended, apply to this project. It is the responsibility of the Contractor, before Bid opening, to request if necessary, any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed Work under this Contract. Federal Minimum Wage Rates as determined by the United States Department of Labor under the Davis-Bacon Act also apply to this project.

A non-mandatory pre-bid conference will be held in the second floor Auditorium at the West Springfield Municipal Office Building, 26 Central Street, West Springfield, MA 01089 on February 21, 2020 at 10:00 AM.

The Town of West Springfield reserves the right to reject any or all bids or to accept any bid if in its judgment the public interest will be best served by doing so.

By Order of Town of West Springfield Department of Public Works

Robert J. Colson, Director

END OF SECTION

SECTION 00200 INSTRUCTIONS TO BIDDERS

SECTION 00200 INSTRUCTIONS TO BIDDERS

1. <u>DEFINED TERMS</u>

a. Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and the Supplementary Conditions, with the following exceptions: The term "Bidder" means one who submits a Bid directly to Owner, as distinct from sub-bidder, who submits a Bid to a Bidder. The term "Successful Bidder" means the responsible Bidder submitting a responsive Bid, to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award of the Contract. The term "Bidding Documents" includes the Bid Advertisement, Instructions to Bidders, Geotechnical Data, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

2. <u>COPIES OF BIDDING DOCUMENTS</u>

- a. Complete sets of the Bidding Documents in the number and for the amount, if any, stated in the Bid Advertisement may be obtained from the party stated in the Bid Advertisement.
- b. Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- c. Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

3. <u>QUALIFICATIONS OF BIDDERS</u>

- a. Bidders shall be experienced in the kind of Work to be performed, shall have the necessary equipment, and shall possess sufficient capital to properly execute the Work within the time allowed. Bids received from Bidders who have previously failed to complete Work within the time required, or who have previously performed similar Work in an unsatisfactory manner, may be rejected. A Bid may be rejected if Bidder cannot show that he has the necessary ability, personnel and equipment to commence the Work at the time prescribed and thereafter to prosecute and complete the Work at the rate or within the time specified. A Bid may be rejected if Bidder is already obligated for the performance of other Work which would delay the commencement, prosecution or completion of the Work.
- b. Bidders shall have a minimum of 10 years of experience and shall have successfully completed 5 sanitary sewer installation projects of similar scope within the past 10 years. Submit with the bid a summary of experience and representative projects to show compliance with these qualifications.

c. Bidders may be investigated by Owner to determine if they are qualified to perform the Work. All Bidders shall be prepared to submit within five days of Owner's or Engineer's request, written evidence of such information and data necessary to make this determination. The investigation of a Bidder will seek to determine whether the organization is adequate in size, is authorized to do business in the jurisdiction where the project is located, has had previous experience and whether available equipment and financial resources are adequate to assure Owner that the Work will be completed in accordance with the terms of the Agreement. Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of such Bidder fails to satisfy Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

4. EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

- a. Subsurface and Physical Conditions
 - 1. The Supplementary Conditions identify:
 - (a) Those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
 - (b) Technical Data contained in such reports and drawings.
 - 2. Copies of reports and drawings referenced above are included in the bid documents. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions or information contained in such reports or shown or indicated in such drawings.
 - 3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
- b. Underground Facilities
 - 1. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or by others. Bidders shall review the terms of Paragraph 5.05 of the General Conditions with respect to Underground Facilities.
- c. Site Visit and Testing by Bidders.
 - 1. On request, and after receipt from Bidder of evidence of satisfactory insurance coverage, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and the advance locating and protection of utilities, and to any other terms and conditions established by Owner.

- d. Reference is made to the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.
- e. It is the responsibility of each Bidder before submitting a Bid to:
 - 1. Examine and carefully study the Bidding Documents, including but not limited to the Drawings, Specifications, any Addenda, data, and the other referenced data identified in the Bidding Documents.
 - 2. Visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - 3. Become familiar with and satisfy itself as to all federal, state, and local laws and Regulations that may affect cost, progress, and performance of the Work;
 - 4. Carefully study all (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 5.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the site which have been identified in the Supplementary 5.06 of the General Conditions.
 - 5. Consider the information known to Bidder, information and observations obtained from visits to the Site, information commonly known to contractors doing business in the locality of the Site, the Bidding Documents, and the reports and drawings identified in the Bidding Documents with respect to the effect of such information and observations on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
 - 6. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
 - 7. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - 8. Be prepared to comply with the applicable requirements of Owner's safety or security programs, if any:
 - 9. Promptly give Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Owner is acceptable to Bidder; and determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- f. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this section, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and

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procedures of construction that may by shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

5. <u>PRE-BID CONFERENCE</u>

a. A pre-bid conference will be held at 10:00 AM local time on February 21, 2020 at the West Springfield Municipal Office Building, 26 Central Street, West Springfield, MA 01089. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are not required to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

6. <u>SITE AND OTHER AREAS</u>

a. The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

7. INTERPRETATIONS AND ADDENDA

- a. All questions about the meaning or intent of the Bidding Documents are to be directed to Engineer in writing via email at david.goncalves@mottmac.com. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded by Engineer as having received the Bidding Documents not later than three days prior to the date fixed for the opening of Bids. Questions received less than five business days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- b. Addenda may also be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner and Engineer.
- c. The Bidder must acknowledge receipt of each Addendum, if any, in the space provided on the Bid Form

8. <u>BID SECURITY</u>

- a. In the Bidding Documents, the terms "Bid security" and "Bid deposit" shall have the same meaning.
- b. A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% of Bidder's maximum Bid price (including any additive alternates) and in the form of a certified check, bank money order, cash, or a Bid bond (on the form included in the

Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

c. All Bid deposits of General Bidders, except those under consideration by Owner, will be returned within 5 days, excluding Saturdays, Sundays and legal holidays, after the opening of General Bids. Other Bid deposits will be returned upon the execution and delivery of the Agreement. The Bid deposit of the Successful Bidder will be retained until such bidder has furnished the required contract security and executed the Agreement, whereupon the bid deposit shall be returned. If the Successful Bidder fails to furnish the required contract security within 15 days after the Notice of Award and execute the Agreement within 5 days after receipt from Owner, Owner may annul the Notice of Award and the Bid deposit of that Bidder will be forfeited to Owner as liquidated damages for such failure.

9. <u>CONTRACT TIMES</u>

a. The dates by which the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

10. <u>LIQUIDATED DAMAGES</u>

a. Provisions for liquidated damages are set forth in the Agreement.

11. <u>SUBSTITUTE AND "OR-EQUAL" ITEMS</u>

- a. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitute or "or-equal" materials and equipment approved by Engineer, accepted by Owner, and identified by Addendum ("Alternatives"). The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as an Alternative unless Bidder submits to Engineer a written request for approval (including any supporting documentation) at least 15 days prior to the date for receipt of Bids. The burden of proof of the merit of the proposed Alternative is upon Bidder. Engineer's decision of approval or disapproval of a proposed Alternative will be final as to Bidder. If Engineer approves any proposed Alternative, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner. The Owner reserves the right to accept or reject proposed Alternatives. The Bid sum for each proposed Alternative shall include all money required to incorporate the Alternative into the Project. Later requests for additional compensation for Alternatives will not be considered.
- b. Substitute or "Or-Equal" items are subject to the requirements of Paragraphs 7.05 and 7.06 of the General Conditions and as modified by the Supplementary Conditions.

12. <u>SUBCONTRACTORS, SUPPLIERS AND OTHERS</u>

a. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to Owner in advance of the specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within seven days after the Bid opening submit to Owner a list of such Subcontractors, Suppliers and other persons and organizations proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent organization information if requested by Owner. If Owner or Engineer after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, Owner or Engineer may before the Notice of Award is given request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price.

- b. If apparent Successful Bidder declines to make any such substitution, Owner may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder.
- c. Any Subcontractor, Supplier, other person or organization listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 7.07 of the General Conditions.
- d. No Contractor shall be required to employ any Subcontractor, Supplier, other person or organization against whom Contractor has reasonable objection.

13. <u>PREPARATION OF BID</u>

- a. The Bid Form is included with the Bidding Documents.
- b. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. The bid must not contain any altered or changed amounts. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternative, adjustment unit price item, and unit price item listed therein
- c. Bids by a corporation must be executed in the corporate name by the president or a vicepresident (or other corporate officer accompanied by evidence of authority to sign). The corporate address and state of incorporation must be shown below the signature.
- d. Bids by a partnership must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- e. Bids by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- f. Bids by a joint venture shall be executed by each joint venture in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- g. Bids must be hand signed in ink by an authorized representative of the Bidder.

- h. All names must be typed or printed below the signatures.
- i. The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which must be filled in on the Bid Form and initialed by the authorized representative of the Bidder).
- j. The address and telephone number for communications regarding the Bid must be shown.
- k. The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.
- 1. In order to be considered for selection, the Bidder must submit a complete bid package in accordance with these Bidding Documents. Partial Bids will not be accepted. Refer to the Bid Form for a list of documents that shall be submitted in addition to the Bid Form.
- m. Any deviations in completion of the Bid Form and accompanying documents from the instructions provided in this Article may be cause for rejection of the Bid.

14. BASIS OF BID;

- a. Unit Price
 - 1. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid Form.
 - 2. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.
 - 3. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.
 - 4. Unit prices for identical item numbers that are in more than one bid schedule shall be equal. Discrepancies will be resolved in favor of the lowest unit price.
 - 5. The award will be based on the lowest eligible Bid.
- b. Allowances
 - 1. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents in accordance with paragraph 13.02 of the General Conditions.

15. <u>SUBMITTAL OF BIDS</u>

- a. A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Invitation to Bid and shall be enclosed in a plainly marked opaque, sealed envelope or package that shows the Project title, and the name and address of Bidder, and shall be accompanied by the other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED."
- b. Bids received after the date and time assigned for the opening of bids will not be accepted and will be returned to the Bidder unopened.

16. MODIFICATION AND WITHDRAWAL OF BIDS

- a. A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- b. If within 24 hours after Bids are opened, any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid.

17. <u>OPENING OF BIDS</u>

- a. Bids will be opened as indicated in the Bid Advertisement and publicly read aloud.
- b. In order to be considered for selection, Bids must arrive at the designated location on or before the date and time specified in the Advertisement for Bids.
- c. No responsibility will attach to Owner, its employees or the Engineer for premature opening of a Bid not properly addressed and identified in accordance with the Bidding Documents.

18. <u>DISQUALIFICATION OF BIDDERS</u>

a. More than one Bid for the same Work from an individual, or a firm, partnership, corporation or an association under the same or different names will not be considered. Reasonable grounds for believing that any Bidder is interested in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder is interested.

19. <u>BIDS TO REMAIN SUBJECT TO ACCEPTANCE</u>

a. All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid prior to the end of this period.

20. <u>AWARD OF CONTRACT</u>

a. Owner reserves the right to reject any and all Bids, to waive any and all informalities, and the right to disregard all nonconforming, nonresponsive or conditional Bids. Owner reserves the right to reject any and all Bids for which the Bidder has been involved in litigation with the Town of West Springfield within the previous 10 years.

- b. Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive any and all informalities and to negotiate contract terms with the Successful Bidder.
- c. More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- d. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- e. Owner reserves the right to reject any Bid if it shows any omissions, alterations of form, additions not called for, conditions or qualifications, or irregularities of any kind.
- f. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, Unit Prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- g. Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.
- h. If the Contract is to be awarded, Owner will award the Contract to the lowest responsive Bidder whose Bid is in the best interests of the Project.
- i. If the contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within the period of time that bids are subject to acceptance.
- j. Contents of the Bid of the Successful Bidder will become part of any contract awarded.

21. <u>CONTRACT SECURITY AND INSURANCE</u>

- a. Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds and proof of insurance.
- b. Within 10 days from the date of the Notice of Award, the Successful Bidder shall deliver to Owner and Engineer, for review and approval, the performance bond and the payment bond proposed to furnish at the time of the execution of the Agreement.

22. <u>SIGNING OF AGREEMENT</u>

a. When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 10 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder.

23. <u>SALES AND USE TAXES</u>

a. Owner is exempt from Massachusetts State sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Bid. The tax exemption number will be provided to the Successful Bidder.

24. <u>RETAINAGE</u>

a. Provisions concerning retainage are set forth in the Agreement.

25. <u>MASSDEP PROJECT REQUIREMENTS FOR SRF-FUNDED PROJECTS</u>

- a. Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void, and of no effect. Where conflict between Code of Federal Regulations and State Laws and Regulations exist, the more stringent requirement shall apply.
- b. The Contractor guarantees that the Work and Services to be performed under the Contract, and all workmanship, materials, and equipment performed, furnished, used, or installed in the construction of the same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications and other Contract documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one year from after the date of completion and acceptance of the Work as stated in the final estimate. If part of the Work is accepted in accordance with that subsection of the Agreement titled "Partial Acceptance," the guarantee for that part of the Work shall be for a period of one year from the date of such fixed acceptance.

If at any time within the said period of guarantee any part of the Work requires repairing, correction, or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction, or replacements. If the Contractor neglects to commence making such repairs, corrections, or replacements to the satisfaction if the Owner within seven days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

c. This project is subject to the Safety and Health Regulations of the US. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments and to any applicable Massachusetts regulations. Contractors shall be familiar with the requirements of these regulations.

- d. Whenever it is written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide an "Efficiency Guarantee Bond" or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.
- e. This Project is subject to the requirements of the Massachusetts Department of Environmental Protection's Diesel Retrofit Program. Bidders must submit a signed and dated Statement of Intent to Comply form as part of their bid proposal documents.

26. <u>MASSACHUSETTS PREVAILING WAGE RATES</u>

a. Minimum Wage Rates as determined by the Commissioner of Department of Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27D, as amended, apply to this project. It is the responsibility of the contractor, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed work under this contract. Federal Minimum Wage Rates as determined by the United States Department of Labor under the Davis-Bacon Act also apply to this project.

27. FEDERAL (DAVIS-BACON) WAGE RATES

- a. Federal Minimum Wage Rates as determined by the United States Department of Labor under the Davis-Bacon Act apply to this project. The Federal Minimum Wages at the time of printing of this document are included in Part II of the Supplementary Conditions.
- b. It is the responsibility of the Bidder before the Bid opening to request any additional information on Federal Wage Rates for those tradespeople who may be employed for the proposed Work under this Contract.

28. <u>COMMONWEALTH OF MASSACHUSETTS SUPPLEMENTAL PROGRAM</u>

a. The Contractor and all subcontractors shall comply with all of the requirements of The Commonwealth of Massachusetts Modified Supplemental Equal Employment Opportunity, Anti-Discrimination and Affirmative Action Program including the certifications attached thereto.

29. <u>MINORITY AND AFFIRMATIVE ACTION WORKFORCE REPORTING SYSTEM</u> <u>PROCEDURES</u>

- a. The Successful Bidder will be required to comply with the following minority and affirmative action workforce reporting system procedures:
 - 1. Contractor must submit the Contractor's Quarterly Projected Workforce Table (CAD 85-1) prior to the commencement of Work and no later than five (5) working days prior to the start of each new quarter to DEP's Contract Compliance Officer.
 - 2. Contractor must submit the Certificate of Work Start-Up By Minority/Women Business Enterprise (Form EEO-DEP-290) within ten (10) days after Work start-up for each minority/women business to DEP's contract Compliance Officer.

- Contractor must submit the Contractor's Weekly Workforce Utilization Report (CAD 85) to DEP's Contract Compliance Officer no later than the following Tuesday of each week.
- 4. Contractor must submit the Quarterly MBE/WBE Activity Report (Form EEO- DEO-290) within ten (10) days following the reporting period to DEP's Contract Compliance Officer.
- 5. Contractor is responsible for the submission of all reports from all of its subcontractors.

END OF SECTION

SECTION 00300 GEOTECHNICAL DATA

SECTION 00300 GEOTECHNICAL DATA

PART 1: GENERAL

a. <u>SUMMARY</u>

- 1. This Section with its referenced attachments provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
 - Information regarding existing subsurface conditions within the limits of the project site is presented merely for the convenience of the Contractor. The Owner and Engineer do not represent that the information on underlying strata, water levels, structures or utilities accurately indicate the conditions at the site at the time the work will be undertaken. The Contractor shall realize that the underlying strata that the Owner has shown for any given boring is indicative only of the underlying strata found at that specific location.
 - The Contractor shall conduct further subsurface investigations as it may deem necessary and shall rely solely on its own interpretation of its own investigations. All costs for such investigations shall be included in the Contract Price bid.
- 2. Boring location map, boring logs, and geotechnical laboratory testing results, as obtained from a geotechnical investigation performed by Mott MacDonald, are available for viewing as appended to this Section.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

END OF SECTION

Mott MacDonald | West Springfield Sewer Expansion Project



This document is issued for the party which commissioned it and for specific purposes connected with the captioned project only. It should not be relied upon by any other party or used for any other purpose. We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties



Eng check		Title
Coordination		BORING LOCATION PLAN
Approved	VAS	SEWER EXPANSION PROJECT
Rev	Security	WEST SPRINGFIELD, MASSACHUSSETS

Mott MacDonald | West Springfield Sewer Expansion Project

MOT	T DONAL	м	м				BORING NO.: B-01 Page 1 of 2								
Projec	t:	West S	pringfield	Sewer I	Expansio	on Pro	ject		Project No.:		_	507	4086	36-002	
Location Client	on:	West Sp Townsh	pringfield,	Massac t Spring	hussets field				Project Mgr: Field Eng. Staff		-	Eric Cod	<u>Pau</u> ly I y	ıli nes	
Drilling	g Co.:	New En	gland Bo	ing					Date/Time Start	ed:	_	July	/ 3, 2	019 at 1:	00 pm
Driller/	Helper:	Scott M	arino /Em	il Chobo	t				Date/Time Finis	hed:		July	3, 2	019 at 2:	48 pm
Elevation Item	 Grade ft 	. Vert Casing	ical Datum	i: bler Cor	e Barrel	Borin	ng Location: In front of 798	Birnie Ave		Coc	ord.: izon	La Ital D	nt: 42 Datum	.1520461	Long: -72.653811
Туре		HSA	SS		-	Rig Make & Model: Mobile B-53 Hammer Type				D	rillin	g Fl	uid	Drill Ro	d Size:
Length Inside Di	a. (in.)	5 ft 3.25	2 f	t '5	-	Tr.	uck ∐ Tripod V ☐ Geoprobe	└┘ Cat-Head ☑ Winch	✓ Safety □ Doughnut		Bento Polvr	onite ner			Casing Advance
Hammer	Wt. (lb.)	140	140)	-		ack 🗌 Air Track	Roller Bit	Automatic		Vate	er			Hollow Stem Auger
nammer									<u> </u>	F	ielo	l Te	sts		
Depth/ Elev. (ft)	No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	S D D	(Density/cons constituents, pa optional descriptior	a Identification & Desc sistency, color, Group N article size, structure, m ns, geologic interpretation	cription lame, noisture, on, Symbol)	Dilatancv	Toughness	Plasticity	Dry Strength		Remarks
	S-1	12	13 17		SP	0.3	Top (4") - ASPHALT Medium dense, brown coa	arse to fine SAND, little coa	arse Gravel, dry		-	-	-	PID = 0.0	PPM
-	0.0'- 2.0'		7				(SP)								
			11												
-	S-2	0	10		SP		No Recovery- Assumed to	be:		-	-	-	-	PID = 0.0	PPM
	2.0'- 4.0'		7		:		Medium dense, brown coa (SP)	arse to fine SAND, little coa	arse Gravel, dry						
-			5												
						4.0									
	S-3	7	4		ML		Medium stiff, brown SILT,	some fine Sand, little fine	Gravel, dry (ML)	-	-	-	-	PP = 1.5 PID = 0.0	tsf) PPM
	4.0'- 6.0'		4												
			2												
-	<u> </u>	16	7		i sm	6.0	Madium dansa, brown cor	area to fine SAND little Sill	t little coarse to	_					DDM
	5-4 60' 80'	10	9		. 31		fine Gravel, dry (SM)	arse to fine SAND, fittle Shi		-	-	-	-	FID = 0.0	
-	0.0-0.0		11												
			21												
-	S-5	19	16		SP	0.0	Very dense, brown coarse	e to fine SAND, little fine Gr	ravel, little Clay,	-	-	-	-	PID = 0.0	PPM
	8.0'- 10.0'		29 50		·]		dry (SP)								
–			63		:										
10					·										
	S-6	13	67 74		SP		Very dense, brown coarse dry (SP)	e to fine SAND, some coars	se to fine Gravel,	-	-	-	-		
-	10.0'- 12.0'		50/3												
-															
-						13.5	5								
L					;	- <u>†</u> -				-					
15					:										
	S-7	12	70 50/2		SM		Very dense, brown coarse trace Clay, dry (SM)	e to fine SAND, some Silt, I	ittle fine Gravel,	-	-	-	-		
F	15.0'- 17.0'														
-					:										
					.]										
-					·	18.5	5								
					•	T				-					
					•										
		Watorl	avel Data	؞ؘ؞ [ٞ] ؞؞ٞ؞ [*]	*	+	Sample Type	Notes:							
		Elapsed	Dep	oth in fee	et to:	0	Open End Rod	Groundwater not en	countered during	drilli	ng a	activ	ities.		
Date	IIme	i ime (hr)	Bot. of Casing	Bottom of Hole	Wate	г	Thin-Wall Tube								
					<u> </u>	U	Undisturbed Sample								
					1	55 c	Spiit Spoon Sample								
						-								Boring N	o.: B-01
Field Te	st Legend	d: Dila	atancy:	N - N	one S-	- Slow Mediu	R - Rapid F	Plasticity: NP - No	on-Plastic L - Lov	w N Nediu	- N	lediu H -	um Hiał	H - High	/erv High
NOTES:	<u>1.) "pp</u> d" de	enotes soil	l sample a	L - Lu erage dia	metral po	cket pe	enetrometer reading. 2.)	"ppa" denotes soil sample	average axial pocket	t pene	etror	nete	r read	ling.	
	3.) Maximu	ım Particle	Size is de	termined I	by direct of	bserva	ation within limitations of sa	mpler size. 4.) Soil ident	tifications and field to	ests t	ase	d on	visua	al-manual	methods per ASTM D2488.

MOT MAC	T DONAL	D M	м			SOIL BORING LOG (continued)						BORING NO.: B-01 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy T	Toughness	Plasticity	Dry Strength		Remarks
-	S-8 20.0'- 22.0'	6	60/2		SW	Very dense, brown coarse to fine SAND, little coarse to fine Gravel, dry (SW)	-	-	-	-		
-	S-9 23.0'- 25.0'	12	50/3		 ML	Hard brown SILT, some fine Sand, little fine Gravel, moist (ML)	-	-	L	L	PP = 1.0	tsf
25						25.0 End of Boring at 25 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	_					
-												
30 												
-												
35 												
-												
-												
- 45												
-						 	PRC		СТІ	NO.	 	BORING NO.:
NOTES	1.) "ppd" d	enotes so	il sample av	erage dian	netral pock	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket r	507	74()86	536	-002	B-01
	3.) Maximi	um Particl	e Size is de	ermined b	/ direct obs	revation within limitations of sampler size. 4.) Soil identifications and field tes	sts b	ase	d on	visu	al-manual i	methods per ASTM D2488.

MOT	T DONAL	м	м			SOIL BORING LOG										BORING NO.: B-02 Page 1 of 2
Project	t:	West S	pringfield-	Sewer E	Expansior	ו Proj	iect			Project No.:		_	507	408	636-002	
Locatio	on:	West S	pringfield,	Massac	hussets					Project Mgr:		_	Eric	Pa	uli	
Client:	-	Townsh	ip of Wes	t Springf	ield					Field Eng. Sta	ff:	_	Cod	y Ly	nes i o	
Drilling	g Co.: Walnam	New En	gland Bor	ing il Choboi	+					Date/Time Sta	rted:	_	July	1,2	2019 at 9:	40 am
Elevation	neiper:	Vert	ical Datum			Porin	a Locatio	n: In front of 722		Date/Time Fin	Coc	ord.:	La	t: 42	2019 at 1 2150311 L	ong: -72 653584
Item		Casing	Samp	ler Cor	e Barrel		g Localic		Birnie Ave		Hor	izon	tal D	atur	n: NAD 19	83
Type		HSA	SS		-	Rig M	lake & Mo	del: Mobile B-5	3	Hammer Type	Di	rillin	g Flu	lid	Drill Ro	d Size:
Inside Di	a. (in.)	3.25	1.37	5	- [V	Geoprobe	Winch	Doughnut		Polyn	ner			
Hammer	Wt. (lb.) Fall (in)	140 30	140)	- 6	Tra	ick	Air Track	Roller Bit	Automatic		Vate	r			Hollow Stern Auger
nammer					- <u>I</u>		lu					-ield	Te	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbol		optio	Visual - Manua (Density/cons constituents, pa onal description	al Identification & Dese sistency, color, Group N article size, structure, m ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancv	Toughness	Plasticity	Dry Strength		Remarks
	S-1	8	14			0.3	Top (4")	- ASPHALT			-	-	-	-		
	0.0'- 2.0'		7		SP		Medium Gravel	dense, dark brow	vn coarse to fine SAND, so	ome coarse to fine						
-			7 11				Graver, e									
-	S-2	18	11		SP		Medium	dense, brown fin	e SAND, little coarse to fin	e Gravel, dry (SP)	-	-	-	-		
	2.0'- 4.0'		8													
-			6 10													
			10													
-	S-3	18	13		SM	4.0	Very den	ise, brown Silty c	oarse to fine SAND, some	fine Gravel, dry		-	-	-		
	4.0'- 6.0'		19				(SM)									
5			42													
			24													
-	S-4	24	19			6.0	Verv stiff	f. brown CLAY. lit	tle coarse to fine Gravel, tr	ace Silt. drv (CL)	-	-		L	PP= 4.0	sf
	6.0'- 8.0'		14				,	, - ,		, , , , ,						
-	0.0 - 0.0		13	///	1											
			29													
-	S-5	24	10	///			Vory stiff	hrown CLAV lit	tle fine Gravel trace Silt m	poist (CL)				.	PP= 2.25	tef
		24	17				very sun		ue inte Graver, trace Sitt, fr	IDIST (CE)	1	-	1	-	2.20	131
-	8.0'- 10.0'		13		1											
			18	///	1											
10	56	24	12	$\mathcal{K}\mathcal{L}$		10.0	Donso h	rown coaree to fi		Sand little Silt						
	3-0	24	23				moist (G	P)	IIIe GRAVEL, IIIIe Coarse o	Sanu, intie Sin,	-	-	-	-		
-	10.0'- 12.0'		20													
			24	0 C	3											
-				0°	4											
				00	4											
-				$^{\circ}$	\$											
				$\mathbb{S}^{\mathcal{O}}$	1											
-																
15	0.7	40		$\sum_{i=1}^{n}$			Vortili									
	3-1	12	22 50/3"	700	GP		very aen	ise, gray coarse t	UTHE GRAVEL, IITTIE SIIT, C	ury (GF)	-	-		-		
┝ │	15.0'- 17.0'			$ \circ\rangle$												
				6_0	4											
┝ │				þŇC	}											
				6 Q°C	1											
- ⊻				b_{0}	1										Ground	ater inferred at 19 fact BCC
	18.0'-'				Y						-	1	1	[Giounaw	ator interred at to leet DGS.
┝│	C 9	2	50/4"	\sum_{i}			Vonida		/EL little Clay, wat (CD)							
	10.0	5	30/1	jõr	Gr		very uer	ISS, USAISE GRAN	LE, mue olay, wel (GP)		-		1	⁻		
	19.0'-	Waterla	evel Data		1	-	Sam	ple Type	Notes:					1		
		Elapsed	Dep	oth in fee	t to:	0	Open I	End Rod	Groundwater inferre	ed at 18 feet BG	3 .					
Date	Time	Time	Bot. of	Bottom	Water	T	Thin-V	Vall Tube								
7/1/19	0:00	-	19.0	21.0	18	U	Undist	urbed Sample								
						ss	Split S	poon Sample								
						G	Grab S	Sample							Boring M	0. B 02
Field T			tanov"	NI NI		<u> </u>	D D-	nid '		on Diactio I		1 14	04:	um l		··· D-V 2
	st Legend	a: Dila Tou	itancy: ighness:	N - N L - Lo	w M-M	Siow lediur	к-ка т Н-Н	րս հ ligh [Dry Strength: NP - No	ne L-Low M-	Jw Mediu	ı - IV Im	H -	un Hig	н - ніgn h VH - V	ery High
NOTES:	1.) "ppd" de	enotes soil	sample av	erage dia	metral poc	ket pe	enetromet	er reading. 2.)	"ppa" denotes soil sample	average axial pock	et pene	etron	neter	rea	ding.	
	3.) Maximu	ım Particle	Size is de	ermined b	y direct ob	oserva	tion within	n limitations of sa	ampler size. 4.) Soil iden	tifications and field	tests b	ase	d on	visu	al-manual	methods per ASTM D2488.

MOT MAC	T DONAL	M	м				BORING NO.: B-02 Page 2 of 2					
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness plai	Plasticity So L	Dry Strength		Remarks
-	21.0'					21.0 End of Boring at 21 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	_					
-												
25												
_												
— 30 -												
-												
-												
-												
40 												
-												
_ 45												
-							PRC	JEC		NO.:		BORING NO .:
NOTES:	<u>1.)</u> "ppd" d	enotes so	il sample av	<u>/erag</u> e dian	netral pock	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket	507	740)86	536	-002	B-02
	3.) Maximu	ım Particl	e Size is de	termined b	y direct obs	servation within limitations of sampler size. 4.) Soil identifications and field to	ests b	ased	lon	visua	l-manual ı	methods per ASTM D2488.

MOT		м	M SOIL BORING LOG													BORING NO.: B-03 Page 1 of 1		
Projec	t:	West Sp	oringfield-	Sewer E	Expansic	n Pro	ject			Project No.:			507	740	8636-002	Page 1 of 1		
Locatio	on:	West Sp	oringfield,	Massac	hussets					Project Mgr:			Eri	сP	auli			
Client:		Townsh	ip of Wes	t Springf	ield					Field Eng. St	aff:	-	Co	dy I	_ynes	10:06 nm		
Driller/	Helper:	Scott Ma	arino /Em	il Chobot	t					Date/Time Si Date/Time Fi	arteu: nished	. '	Jul	<u>y 1</u> v 1	, 2019 at 3	3:30 pm		
Elevation	1: Grade ft	Vert	ical Datum	:		Borin	g Location	: Intersection of	of Piper Rd and Birnie Ave		Co	ord.	: L	at: 4	42.1488764	Long: -72.6537734		
Item Type		Casing	Samp	oler Cor	e Barrel	Ria M	lake & Mor	el· Mobile B-F	3	Hammer Type	Ho > F	rizo rilli	ntal ng F	Dat Iuid	um: NAD 1	983 od Size:		
Length		5 ft	2 f	t	-	Tn.	uck		Cat-Head	Safety		Bent	tonite	Э		Casing Advance		
Inside Di Hammer	<u>a. (in.)</u> Wt. (lb.)	3.25	1.37)	-		V L ack D	」Geoprobe]Air Track	M Winch Roller Bit	□ Doughnut □ Automatic		Poly Wat	mer er			Hollow Stem Auger		
Hammer	Fall (in.)	30	30		-	□ Sk	id 🗌]	Cutting Head			Non	e d Ta	ta				
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	S D D	V co optior	(isual - Manu (Density/cor onstituents, p nal descriptio	al Identification & Des sistency, color, Group particle size, structure, r ns, geologic interpretat	scription Name, moisture, tion, Symbol)			Plasticity			Remarks		
_	S-1 0.0'- 2.0' 0.3'-'	15	13 15 7 9	X	GW	0.3	Top (4") - Medium d trace Clay	ASPHALT ense, coarse to , dry (GW)	o fine GRAVEL, some coar	rse to fine Sand,					Likely s	ubbase material.		
-	S-2 2.0'- 4.0'	18	12 11 10 12		GM	2.0	Medium d	ense, brown G	RAVEL, some fine Sand, li	ittle Silt, dry (GM)		- 				
	S-3 4.0'- 6.0'	19	10 9 12 17		GM	6.0	Medium d	ense, brown G	RAVEL, some fine Sand, li	ittle Silt, dry (GM)		- .	- -	. .				
_	S-4 6.0'- 8.0'	19	12 18 25 33		SP		Dense, bro moist (SP	own coarse to i)	medium SAND, little fine G	Gravel, little Silt,		- 				
-	S-5 8.0'- 10.0'	16	47 14 9 12		SP	10.0	Medium d (SP)	ense, brown fir	ne SAND, little Silt, little fin	e Gravel, moist		- .	- -					
_	S-6 10.0'- 12.0'	24	13 12 17 27		ML		Very stiff, trace Clay	brown SILT, so , wet (ML)	me coarse to fine Gravel, t	trace fine Sand,		- .	- L	. 1	- PP = 4. Ground	5 tsf water inferred at 10 feet BGS.		
- 15	S-7 15.0'- 17.0'	7	50/2		GP	13.5	Very dens wet (GP)	e, brown coars	e to fine GRAVEL, little Cla	ay, little fine Sand	 ,	- .						
-						17.0) End of Bo Borehole I	ring at 17 feet I backfilled with	BGS. soil cuttings and restored v	with asphalt patch								
		Water Le	evel Data			+	Samp	e Type	Notes:									
Det	T :	Elapsed	Dep	oth in fee	t to:	0	Open E	nd Rod	Groundwater infer	red at 10 feet	BGS.	S	Soils	СС	onsistent	with glacial till geology		
Date	IIme	i ime (hr)	Bot. of Casing	Bottom of Hole	Water	T	Thin-Wa	all Tube	observed througho	ut boring.								
7/1/19	0:00	-	10.0	12.0	10	٦u	Undistu	rbed Sample										
						SS	Split Sp	oon Sample										
						G	Grab Sa	impie							Boring I	No.: B-03		
Field Te	st Legen	d: Dila	itancy:	N - N	one S-	Slow	R - Rap	id	Plasticity: NP - N	Ion-Plastic L -	Low M	/ - N	Nedi	um	H - Higi	<u> </u>		
NO	4.5.8	Tou	ghness:	L - Lo	w M-I	Mediu	m H-Hig	gh	Dry Strength: N - No	ne L-Low M	- Medi	um	H	- Hi	gh VH-	Very High		
NOTES:	<u>1.) "ppd" d</u> 3.) Maximu	enotes soil ım Particle	sample av Size is de	<u>erage dia</u> termined b	metral po by direct c	cket pe bserva	enetrometer ation within	reading. 2.)	<u>ppa" denotes soil sample</u> ampler size. <u>4</u> .) Soil ider	e average axial po ntifications and fie	cket per Id tests	etro base	mete ed or	er re 1 vis	ading. ual-manua	methods per ASTM D2488.		

MOT		M	м			SOIL BORING LOG									BORING NO.: B-04
Projec	t:	West S	pringfield	- Sewer	Expansio	n Pro	ject		Project No.:		_	507	408	636-002	Page 1 of 1
Locatio	on:	West S	pringfield,	Massac	hussets				Project Mgr:		-	Eric	Pa	uli	
Drilling	a Co.:	New En	gland Bor	ring	leid				Date/Time Start	: ted:	-	July	iy ∟y / 2, 1	<u>nes</u> 2019 at 8:	30 am
Driller/	Helper:	Scott M	arino /Em	il Chobo	t				Date/Time Finis	hed:		July	/ 2, 1	2019 at 9:	30 am
Elevation	 Grade fl 	. Vert	ical Datum	1: Nor Co	o Parrol	Borin	g Location: In front of 639	Birnie Ave		Coc	ord.:	La	at: 42	2.148247 L	.ong: -72.654837
Туре		HSA	San		-	Rig M	lake & Model: CME-55LC		Hammer Type	D	rillir	ng Fl	uid	Drill Ro	d Size:
Length Inside Di	a. (in.)	5 ft 3.25	2 f	it 75	-		uck Tripod Geoprope	□ Cat-Head ✔ Winch	□ Safety □ Doughput		Bent Polvi	onite mer	•		Casing Advance
Hammer	Wt. (lb.)	140	140	0	-	Tra	ack 🛛 Air Track	Roller Bit	Automatic		Vate	er			Hollow Stem Auger
Hammer		30	30		-				<u> </u>	F	ielo	e d Te	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	s o ol	Visual - Manu (Density/con constituents, pa optional description	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretati	c cription Name, noisture, ion, Symbol)	Dilatancv	Tourdhness	Plasticity	Dry Strength		Remarks
	S-1	12	11			0.4	Top (5") - ASPHALT			-	-	-	-		
L	0.0'- 2.0'		14 16		SP		Medium dense, brown co Gravel, dry (SP)	arse to medium SAND, so	me coarse to fine						
			15												
_		47	40			2.0									
	S-2	17	13 13		SM		Medium dense, brown Sil	ty fine SAND, trace fine Gi	ravel, dry (SM)	-	-	-	-		
_	2.0'- 4.0'		16 16												
-	S-3	24	9		ML	4.0	Very stiff, brown SILT, sor	me fine Gravel, little Clay, o	dry (ML)	┥.		L		PP= 2.5	sf
	4.0'- 6.0'		7				, , , , ,	- , - , ,	,						
5			8 11												
L															
	S-4	19	11		ML		Very stiff, brown SILT, littl	e coarse to fine Gravel, litt	tle Clay, dry (ML)	-	-	L	L	PP= 2.5	isf
L	6.0'- 8.0'		12												
			20												
-	S-5	16	11		S GP	8.0	Medium dense, brown Sa	andy fine GRAVEL little Sil	It trace Clay	┦.		_	.		
	8 0'- 10 0'	10	14	[0]			moist (GP)		it, trace clay,						
-	0.0 - 10.0		15	60	4										
			45	$b \bigcirc C$	}										
1 0 2	S-6	6	21	⁶ ⁰ [°] <	GP		Very dense, brown Sandy	coarse to fine GRAVEL, li	ittle Silt, trace	-	-	-	-	Groundw	ater inferred at 10 feet BGS.
	10.0'-		50/2"		1		Clay, wet (GP)							Cobble o at 10.5 fe	r boulder likely encountered et BGS.
-	12.0'			[0]	1										
L				00	4										
				b	}										
L				βΩζ<											
]										
-				[0]	1										
				00	4										
15	S-7	16	22	b) GP		Dense, brown coarse to fi	ine GRAVEL, wet (GP)		.			.		
	15.0'-		11	$\mathbb{S}^{\mathcal{O}}$	1			,(or)							
F	17.0'		19 24]										
			24	[0)	1	17 0)								
F				ľ,	1	1.7.0	End of Boring at 17 feet B	GS.	sphalt patch						
							Borenoie lilled with soil co	utungs and restored with a	isphait patch.						
F					1										
		Water I 4	evel Data		1		Sample Type	Notes:							
Det	T !	Elapsed	Der	oth in fee	et to:	0 Open End Rod Groundwater inferred at 10 feet BGS. Soils consister								sistent v	vith glacial till geology
Date	i ime	(hr)	Bot. of Casing	of Hole	Water	т	Thin-Wall Tube	observed throughou	ut boring.						
7/2/19	9:12	-	10.0	12.0	10	U	Undisturbed Sample								
							Split Spoon Sample								
						٦Ľ	Grab Gample							Boring N	o.: B-04
Field Te	st Legen	d: Dila	tancy:	N - N	one S-	Slow	R - Rapid I	- Plasticity: NP - N	on-Plastic L - Lov	w N	1 - N	/ledi	um Lu:	H - High	/on/ High
NOTES	1.) "baa" (.1	I OL	ignness:	L - LO	w w w w w w w w w w w w w w w w w w w										
INUTES:	3.) Maximu	um Particle	Size is de	termined	by direct o	bserva	ition within limitations of sa	ampler size. 4.) Soil iden	ntifications and field t	ests t	ase	ed on	visu	al-manual	methods per ASTM D2488.

MOT		M	м			SOIL BORING LOG									BORING NO.: B-05		
Projec Locatio	t: on:	West S West S	pringfield pringfield,	- Sewer E Massacl	Expansior nussets	n Proje	ct				Project No.: Project Mgr:		_!	5074 Eric	1086 Pau	36-002 Ili	Page 1 of 2
Client:		Townsh	ip of Wes	st Springf	ield						Field Eng. Staf	f: todi	_(y Ly	nes	00 am
Driller/	Helper:	Scott M	arino /Em	il Chobot							Date/Time Stat	shed:		July	9, 2 9, 2	019 at 9.):15 am
Elevation	1: Grade ft	. Vert	ical Datum	1:		Boring	Location:	In front of 15	92 Piper Ave			Coo	rd.:	La	t: 42	1482281	Long: -72.65198817
Item Type		Casing HSA	Samp SS	oler Cor	e Barrel	Rig Mal	ke & Mode	el: Mobile B-	53		Hammer Type	Hori	zont	al D g Flu	atun iid	n: NAD 19 Drill Ro	83 d Size:
Length	o (in)	5 ft	2 f	t 75	- 6		k 🛛	Tripod	Cat-Head		Safety	В	ento	nite			Casing Advance
Hammer	Wt. (lb.)	140	1.07))	- [Track	k 🛛	Air Track	Roller Bit				/atei	r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		- l								one ield	Tes	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbol	I	Vi co option	sual - Man (Density/con nstituents, p al descriptio	ual Identificati nsistency, colo particle size, s ons, geologic i	ion & Des or, Group I tructure, n nterpretat	cription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
_	S-1 0.0'- 2.0'	20	15 48 48 30		SP	0.4 T V d	Γοp (5") - A /ery dense Iry (SP)	SPHALT , brown coars	se to fine SAND,	some coar	rse to fine Gravel,	-	-	-	-		
-	S-2 2.0'- 4.0'	18	50 27 18 24		SP	[(\$	Dense, bro SP)	wn medium t	o fine SAND, litt	le medium t	to fine Gravel, dry	-	-	-	-		
	S-3 4.0'- 6.0'	11	8 9 47 49		SC	4.0 V	/ery dense	, brown fine S	SAND, some Cla	ay, moist (S	SC)	-	-	-	-		
-	S-4 6.0'- 8.0'	0	55 55 63 48		SC	N V	lo Recove /ery dense	ry- Assumed , brown fine \$	to be: SAND, some Cla	ay, moist (S	SC)	-	-	-	-		
-	S-5 8.0'- 10.0'	20	25 25 26 45		SC	V 10.0	/ery dense noist (SC)	, brown coars	se to fine SAND,	little Clay,	little fine Gravel,	-	-	-	-		
	S-6 10.0'- 12.0'	13	55 20 22 27		GW		Dense, bro	wn coarse to	fine GRAVEL, li	ttle Silt, mo	ist (GW)	-	-	-	-		
	S-7 15.0'- 17.0'	11	22 17 11 14		GW	N Vi	леdium de vet (GW)	nse, brown c	oarse to fine GR	AVEL, little	e coarse Sand,	-	-	-	-	Groundw	ater inferred at 16 feet BGS.
-		Water Lo	evel Data				Sample	Э Туре	Notes:								
Data	Time	Elapsed	Dep Bot of	oth in fee	t to:	O Open End Rod Groundwater inferred at 16 feet BGS.								w likely operator-			
Date	, inte	(hr)	Casing	of Hole	Water	T Thin-Wall Tube Coarse gravel and cobbles, indicative of glacial till ge throughout boring.							n geolog	ly, likely encountered			
7/9/19	10:00	-	20.0	22.0	16	U	Undistur	on Sample	•								
						6	Grah Sar	on sampie nole									
						Ľ										Boring N	o.: B-05
Field Te	st Legen	d: Dila	atancy:	N - No	one S-	Slow	R - Rapio	1 h	Plasticity:	NP - N	on-Plastic L - Lo	w M	- M	ediu µ	IM Hiat	H - High	en/High
NOTES	h "baa" (.1	enotes soil	iginicoo. I sample av	erade diar	metral noc	ket pen	etrometer	reading. 2) "ppa" denotes	soil sample	average axial nock	et pene	trom	neter	read	lina.	
	3.) Maximu	um Particle	Size is de	termined b	y direct ob	servatio	on within li	mitations of s	sampler size.	4.) Soil ider	ntifications and field	tests b	asec	lon	visua	al-manual i	methods per ASTM D2488.

MOTT M MACDONALD			м		SOIL BORING LOG						BORING B-C Page 2	G NO.: 05 2 of 2	
Depth/ Elev. (ft)	Depth/ Elev. (ft) (ft) Rec. (ft) (in)			Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness Dia	Plasticity	Dry Strength St		Remarks	
-	S-8 20.0'- 22.0'	8	60/2		GW	Very dense, brown coarse to fine GRAVEL, little Clay, wet (GW)	-	-	-	-			
-					-	22.0 End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.							
-													
-													
-													
-													
- 35													
_													
_													
_													
_													
- 45													
-													
NOTES	NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading.												
3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.													

MOT	T DONAL	м	м					SOI	L BORING LO	G						BORING NO.: B-05A	
Project	t:	West Springfield- Sewer Expansion Project Project No.: 507408636-002											636-002	Page 1 of 3			
Locatio	on:	West Springfield, Massachussets Project Mgr: Township of West Springfield Field Eng. Staff:												Pa	uli		
Drilling	g Co.:	New En	gland Bo	ring	leia		Field Eng. Staff Date/Time Starf				ted:	_	Aug	y ∟y ust	nes 21, 2019	1, 2019 at 9:10 am	
Driller/	Helper:	Scott Ma	arino /Em	il Chobot		Date/T				Date/Time Finis	shed		Aug	ust	21, 2019	at 1:30 pm	
Elevation	 Grade ft 	. Verti Casing	ical Datum Sami	n: Dier Core	e Barrel	Boring Location: Wooded area across from 1592 Piper Road						ord.: izon	La tal D	t: 42 atur	1479711 n: NAD 19	Long: -72.6521477	
Type		HW	SS	3	-		ake & Mod	el: Mobile B-5	Hammer Type	D	rillin	g Flu	uid	Drill Ro	Drill Rod Size:		
Inside Di	a. (in.)	4	1.37	75	-		V L	Geoprobe	Winch	Doughnut		Polyn	ner			Mud Rotary	
Hammer Hammer	Wt. (lb.) Fall (in.)	-	140 - 30 -			M Tra □ Ski	ck L d D	. □ Air Track M Roller Bit □ Automatic □ □ Cutting Head □				Nate None	r			maarioaly	
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	; o ol	V cc option	'isual - Μαιι (Density/cor onstituents, p nal descriptio	al Identification & Desensistency, color, Group N particle size, structure, n ons, geologic interpretati	cription Name, noisture, ion, Symbol)	ilatancv -	oughness	lasticity aL	ry Strength		Remarks	
-	S-1 0.0'- 2.0' S-2	14	3 4 4 8 34		SW	2.0	Loose, gra (SW) Very dense	y coarse to fin	e SAND, some coarse to fir	ne Gravel, dry			-	-			
-	2.0'- 4.0' S-3	4	58 50/5" 22		GM	4.0	Gravel, dry (SP)										
— 5	4.0'- 6.0'	-	26 20 31				dry (GM)										
-	S-4 6.0'- 8.0'	15	34 34 29 27		GM		Very dense, brown coarse to fine GRAVEL, some coarse Sand, little Silt, dry (GM)							-			
- 	S-5 8.0'- 10.0' 9.0'-'	13	22 19 21 19		GM	Dense, brown coarse to fine GRAVEL, some Silt, little coarse Sand, trace Clay, wet (GM)						-	-	-	Groundwater inferred at 9 feet BGS.		
10 	S-6 10.0'- 12.0'	0	37 60/4"		GM	No Recovery- Assumed to be: Very dense, brown coarse to fine GRAVEL, some Silt, little coarse Sand, wet (GM)					-	-	-	-			
-					13.5					_							
-	5-7 15.0'- 17.0'	8	54 40 41 45		GC		Very dense	e, brown coars	e to fine GRAVEL, little Cla	y, wet (GC)	-		-	-			
		Water Le	evel Data		t to:		Sampl	e Type	Notes:	han han di di		-			- 11 1 - 1		
Date	Time	⊢lapsed Time	Der Bot. of	Bottom	t to: Water	- 0	Open Er	nd Rod	Depth to groundwater based on observed change in soil moisture during drilling. Soils consistent with glacial till geology observed throughout boring.								
8/21/10	0.00	(hr) -	Casing	of Hole			unin-Wa Undistur	all Tube bed Sample	Tube ed Sample on Sample								
5/21/13	0.00	_				ss	Split Spo	oon Sample									
						G	Grab Sa	mple							Boring N		
Field To	stlagor		tancy:	N - N/	one S	Slow	R - Rani	d	Plasticity: NP. N/	on-Plastic L_Lo	w N	1 - 14	ediv	Im		0 D-UJA	
	si Legeni	Tou	ighness:	L - Lo	w M-N	Aediur	n H - Hig	gh	Dry Strength: N - Nor	ne L-Low M-	Mediu	um	H -	Hig	h VH - V	′ery High	
NOTES:	1.) "ppd" d 3.) Maximi	enotes soil um Particle	sample av Size is de	verage diar	netral poo	cket pe bservat	netrometer	reading. 2.)	"ppa" denotes soil sample ampler size. 4.) Soil iden	average axial pocket tifications and field	et pen tests l	etron	neter d on	rea	ding. al-manual	methods per ASTM D2488	
L					,												

MOTT M MACDONALD			м									BORING NO.: B-05A Page 2 of 3	
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	⁹ Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity	Dry Strength		Remarks	
-	S-8 20.0'- 22.0'	4	60/4"		GC	Very dense, brown coarse to fine GRAVEL, little Clay, wet (GC)	-	-	-	-	Possible	weathered bedrock.	
25 	S-9 25.0'- 27.0'	0	50/1"		GC	No Recovery- Assumed to be: Very dense, brown coarse to fine GRAVEL, little Clay, wet (GC)	-	-	-	-	Possible	weathered bedrock.	
	S-10 30.0'- 32.0'	0	50/1"		GC	No Recovery Assumed to be: Very dense, brown coarse to fine GRAVEL, little Clay, wet (GC)	-	-	-	-	Possible	weathered bedrock.	
	S-11 35.0'- 37.0'	1	50/1"		GM	Very dense, brown coarse GRAVEL, little Silt, moist (GM)	-	-	-	-	Possible	weathered bedrock.	
	S-12 40.0'- 42.0'	3	100/3"		GM	Very dense, brown coarse to fine GRAVEL, little Silt, moist (GM)	-	-	-	-	Possible	weathered bedrock.	
	S-13 45.0'- 47.0'	2	100/2"		GM	Very Dense, brown coarse to fine GRAVEL, little Silt, mosit (GM)	-	-	-	-	Possible	weathered bedrock.	
NOTES:	1.) "ppd" d	enotes so	il sample av	verage dian	netral pocke	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket	PRC 507	JE 74(CT 086	NO.	: 5-002 ding.	BORING NO.: B-05A	
	3.) Maximu	im Particl	e Size is de	termined by	y direct obs	ervation within limitations of sampler size. 4.) Soil identifications and field te	sts b	asec	d on	visu	al-manual	methods per ASTM D2488.	
MOT MAC	T DONAL	M	м			SOIL BORING LOG						BORING NO.: B-05A Page 3 of 3	
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Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Toughness D	Plasticity BaL	Dry Strength		Remarks	
- 	S-14 50.0'- 52.0'	3	100/3"		GM	Very Dense, brown coarse to fine GRAVEL, little Silt, moist (GM) 52.0 End of Boring at 52 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	-	-	-	-	Possible	weathered bedrock.	
60 													
- 65													
-													
-													
NOTES:	PROJECT NO.: BOI 507408636-002 B-												
	3.) Maximu	m Particle	e Size is de	termined b	y direct obs	servation within limitations of sampler size. 4.) Soil identifications and field tes	ts ba	ased	on	visua	al-manual i	nethods per ASTM D2488.	

MOT	T DONAL	LD M M SOIL BORING LOG														BORING NO.: B-06
Projec	t:	West St	oringfield-	Sewer I	Expansio	on Pro	ject			Project No.:		į	5074	4086	36-002	Page 1 of 2
Locatio	on:	West Sp	oringfield,	Massac	hussets					Project Mgr:			Eric	Pau	ıli	
Client:		Townsh	ip of Wes	t Spring	field					Field Eng. Staff	:	_(Cod	y Ly	nes	1:20 am
Driller/	/Helper:	Scott Ma	arino /Em	il Chobo	t					Date/Time Start	eu. hed:	,	July	3, 2	019 at 9:	20 am
Elevation	n: Grade ft	Vert	ical Datum	:		Borin	g Location	n: In front of 153	30 Piper Ave		Coo	rd.:	La	t: 42	.1480809	Long: -72.6495463
Item Type		Casing	Samp	oler Cor	e Barrel	Ria M	lake & Mo	del: Mobile B-5	3	Hammer Type	Hori	zont	tal D	atun	n: NAD 19	83 d Size:
Length		5 ft	2 f	t	-	Tr.	uck [Cat-Head	Safety	□ в	ento	nite	iiu	Dimite	Casing Advance
Inside Di Hammer	a. (in.) Wt. (lb.)	3.25 140	1.37	75 D	-		V L ack [☐ Geoprobe ☐ Air Track	Winch Roller Bit	M Doughnut M Automatic		olym /atei	ner r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	□ Sk	id [Cutting Head		M N	one	-	. 1		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	S p ol	c optio	Visual - Manu (Density/con constituents, p nal descriptio	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancy	Loughness	Plasticity	Dry Strength		Remarks
	S-1	16	13		*	0.4	Top (5") -	ASPHALT			-	-	-	-		
L	0.0'- 2.0'		17 21		SW		Dense, br (SW)	rown coarse to f	fine SAND, some coarse to	fine Gravel, dry						
			20		•											
F		10	10		۰ ۸۸	2.0	Versetiff		le coorec to fine Crevel littl	la agazag Cand	_		Ι.			
-	2.0'- 4.0'	19	10 7 10 12		ML		dry (ML)	biown Sill I, iiu	ie coarse to fine Gravel, fitt	ie coarse Sand,		-		IVI		
_ 5	S-3 4.0'- 6.0'	16	13 9 6 9		SM	4.0	Medium o (SM)	dense, brown Si								
L					<u>:</u>	6.0										
-	S-4 6.0'- 8.0'	23	9 13 13 31		ML		Very stiff,	brown Sandy S								
-	S-5 8.0'- 10.0'	0	50/0		ML		No Recov Brown Sll	very- Assumed t LT, some coars	Boulder li BGS.	kely encountered at 8 feet						
— 10	S-6	0	50/0		SP	<u> 10.0</u>) No Recov Dense, br (SP)	very- Assumed t rown coarse to f	o be: iine SAND, little fine Gravel	 I, trace Silt, moist		-	-	-	Boulder li BGS.	kely encountered at 10 feet
15	12.0'						(37)									
-	S-7 16.0'- 18.0'	22	7 18 27 30		SP	19.0	Dense, br (SP)	rown coarse to f	ine SAND, little fine Gravel	l, trace Silt, moist	-	-	-	-		
F				////	<u>†</u>	- +					-1					
∇				<u> </u>	1	20.0)									
		Water Le	evel Data Der	oth in fee	et to:		Samp	ind Rod	Notes:	red at 20 feet P	GS	50	nile	COP	sistent u	ith glacial till geology
Date	Time	Time	Bot. of	Bottom	Wate		Upen E	all Tube	observed throughou	ut boring.	33.	30	115	COUR	ອາວເຮາາໃ W	па уластат ин деоюду
7/2/19	11:00	(hr) -	28.0	01 Hole 30 0	20	'	Undistu	Irbed Sample								
112/13	11.00	-	20.0	30.0	20	∃ss	Split Sp	boon Sample								
					+	- G	Grab Sa	ample							_	
					1										Boring N	o.: B-06
Field Te	st Legend	d: Dila	tancy:	N - N	one S	- Slow	R-Rap т н ₋ ⊔	oid iah	Plasticity: NP - No	on-Plastic L - Low	w M Mediu	- M	ediu H -	im Hiał	H - High	ery High
NOTES	h "baa" (.1	enotes soil	sample av	erade dia	metral po	icket ne	enetromete	r reading. 21	"ppa" denotes soil sample	average axial nocke	t pene	trom	neter	rear	lina.	
INUTED:	3.) Maximu	im Particle	Size is de	termined l	by direct of	observa	tion within	limitations of sa	ampler size. 4.) Soil iden	tifications and field t	ests b	asec	lon	visua	al-manual i	nethods per ASTM D2488.

MOT MAC		м	м			SOIL BORING LOG						BORING NO.: B-06
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	(continued) Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Ioughness	Plasticity	Dry Strength		Page 2 of 2
-	S-8 20.0'- 22.0'	18	80 51 50 60		CL	Hard, dark brown CLAY, some coarse to fine Gravel, moist (CL)	-	-	L	L		
- 25 - - -	S-9 25.0'- 27.0'	24	53 45 53 60		CL	Hard, gray CLAY, some coarse to fine Gravel, moist (CL)	-	-	L	м	Boulder Rollerbit encounte	encountered at 28' BGS. to 30' BGS, bedrock not red.
						End of Boring at 30 feet BGS. Borehole grouted with soil cuttings and bentonite holeplug.						
35 												
- 												
-												
— 45 —												
		·					PRC 507	JE 74(ст 086	NO.	6-002	BORING NO.: B-06
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	bil sample av e Size is de	verage dian termined by	netral pock y direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pock servation within limitations of sampler size. 4.) Soil identifications and field	tests b	trom	neter d on	r rea visu	ding. al-manual	methods per ASTM D2488.

MOT		M	м					SOIL	. BORING LO	G						BORING NO.: B-07
Project	+-	West Si	pringfield.	. Sewer F	znansio	n Pro	iect			Project No :			5074	1086	36-002	Page 1 of 2
Locatio	on:	West S	pringfield,	Massac	hussets		Jeol			Project Mgr:		 	Eric	Pau	li	
Client:		Townsh	ip of Wes	t Springf	ield					Field Eng. Staff	:	_	Cod	y Ly	nes	
Drilling	g Co.:	New En	gland Bor	ing						Date/Time Start	ed:	_	July	3, 2	019 at 9:	50 am
Driller/	Helper:	Scott M	arino /Em	il Chobot	t					Date/Time Finis	hed:		July	3, 2	019 at 12	2:00 pm
Elevation	 Grade ft 	. Vert	ical Datum	i: Nor Cor	o Barrol	Borin	g Location: Near	1480 Pip	er Ave		Coo	rd.:	La	t: 42	.1478224	Long: -72.6481462
Туре		HSA	SS		-	Rig N	lake & Model: Mo	bile B-53	;	Hammer Type	Dr	illing	g Flu	uid	Drill Ro	d Size:
Length	a (in)	5 ft	2 f	15	-	Tr.	uck 🗌 Tripo	d	Cat-Head	Safety		ento	nite			Casing Advance
Hammer	a. (iii.) Wt. (lb.)	140	140)	-		v ⊡ Geoµ ack ⊡ Air Tr	rack	Roller Bit	Automatic		/ater	r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	□ Sk	id 🗌		Cutting Head		N N	one	Ta	ata I		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	1	Visual - (Dens constitu optional des	• Manua sity/cons ents, pa scription	Il Identification & Desc istency, color, Group N irticle size, structure, m is, geologic interpretati	cription Name, noisture, on, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
	S-1	16	24			0.6	Top (7") - ASPHA	LT			-	-	-	-	PID = 0.0	PPM
	0.0'- 2.0'		33		SW		Very dense, light	brown co	parse to fine SAND, some	coarse to fine						
			34		•		Gravel, little Clay,	ary (Svv)							
				• • • • • • • • •	•	2.0										
	S-2	20	30		SP		Dense, brown fine	e SAND,	little coarse to fine Gravel,	, dry (SP)	-	-	-	-	PID = 0.0	PPM
_	2.0'- 4.0'		24 14													
			7													
_					SP Dense, light brown medium to fine SAND, little Silt, trace fine Gravel, dry (SP)											
	S-3	12	7		SP Dense, light brown medium to fine SAND, little Silt, trace fine Gravel, dry (SP) 6.0										PID = 0.0	PPM
	4.0'- 6.0'		21		SP Dense, light brown medium to fine SAND, little Silt, trace fine Gravel, dry (SP) - - - - - PID = 0.0 PPM 6.0 - - - - - - - - PID = 0.0 PPM											
-			20		SP Dense, light brown medium to fine SAND, little Silt, trace fine Gravel, dry (SP) - - - - - PID = 0.0 PPM 6.0 - - - - - - PID = 0.0 PPM SM Very dense, brown Silty coarse to fine SAND, little coarse to fine - - - - PID = 0.0 PPM											
	S-4	20	17		6.0 SM Very dense, brown Silty coarse to fine SAND, little coarse to fine PID = 0.0 P Gravel, dry (SM)											PPM
	6.0'- 8.0'		43		·											
			40													
						8.0										
	S-5	6	15		SP		Very dense, brow Clay, wet (SP)	n coarse	SAND, some coarse to fir	ne Gravel, trace	-	-	-	-	Groundwa PID = 0.0	ater inferred at 9 feet BGS.) PPM
\Box	8.0'- 10.0'		50/3		·											
_																
-	S-6	7	68 33		SP		Very dense, brow Clay, wet (SP)	n coarse	SAND, some coarse to fir	ne Gravel, little	-	-	-	-		
_	10.0'- 12.0'		50/3		·											
_																
-																
				~	; 	13.5	<u>;</u>				_					
-																
				T/}	3											
15	0.7	10	11	Ø L			Van danaa kuu			101/ these second						
	5-7	10	11 27	CS7			Sand, wet (GC)	n coarse	to fine GRAVEL, some CI	lay, trace coarse	-	-	-	-		
F	15.0'- 17.0'		38	41)												
			62	Ì												
╞					ł											
				CA H]											
-																
				SZ X	3											
╞				K K	\$											
				(ST)	\$											
		Water Le	evel Data	02/6×	4	+	Sample Type	e	Notes:				I			
-	- .	Elapsed	Dep	oth in fee	t to:	0	Open End Roc	ł	Groundwater inferre	ed at 9 feet BGS.	Soils	cor	nsist	tent	with glac	ial till geology observed
Date	lime	l ime (hr)	Bot. of Casing	Bottom of Hole	Water	Т	Thin-Wall Tub	e	throughout boring.							
7/3/19	10:15	-	20.0	22.0	9	Jυ	Undisturbed S	ample								
						ss	Split Spoon Sa	ample								
						G	Grab Sample								Borina N	o.: B-07
Field To	st Lecen	l ∙ Dila	itancy:	N - N	l one S-	Slow	R - Ranid		lasticity: NP - Nr	on-Plastic L-Lo	N M	- M	ediu	ım	H - Hinh	
		Tou	ighness:	<u>L - Lo</u>	<u>w M-N</u>	/lediu	m H - High		Dry Strength: N - Nor	$\frac{1}{100} = \frac{1}{100} = \frac{1}$	<i>N</i> ediu	m	H -	High	<u>1 VH-</u> V	ery High
NOTES:	1.) "ppd" d	enotes soil	sample av	erage dia	metral poo	ket pe	enetrometer reading	g. 2.)"	ppa" denotes soil sample	average axial pocke	t pene	trom	eter	read	ling.	
	з.) Maximu	im Particle	Size is de	ermined b	y airect of	oserva	ation within limitatio	ons of sa	mpier size. 4.) Soil iden	uncations and field to	ests b	asec	on	visua	a-manual r	netnods per ASIM D2488.

MOT MAC	T DONAL	M	м									BORIN B-	G NO.: 07 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity	Dry Strength		Remarks	
-	S-8 20.0'- 22.0'	3	70 60/3		GC	Very dense, brown coarse to fine GRAVEL, some Clay, little coarse Sand, wet (GC)	-	-	-	-			
-				<u> </u>		End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.							
-													
-													
30 													
_													
-													
— 35 —													
-													
_ 40													
-													
-													
45													
							PRC			NO.:	-002	BORING NO).:
NOTES:	1.) "ppd" d	enotes so	il sample av	verage dian	netral pock	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocke	t pene	trom		read	ding.	methods per AS	STM D2488
L	5.7 WGAIIII		- 0120 13 UE	.ommeu D	, and of OD			. .		1300	a manual		

MOT	T DONAL	м	м	SOIL BORING LOG												BORING NO.: B-08
Project	t:	West S	pringfield	- Sewei	Expansion	on Pro	oject			Project No.:		_	5074	4086	636-002	Page 1 of 2
Locatio	on:	West S	pringfield,	, Massa	chussets					Project Mgr:	_	_	Eric	Pau	uli	
Drilling	Co.:	New En	gland Bor	ring	grieid					Date/Time Start	: ed:	_	<u>Jun</u>	<u>y∟y</u> e 28	<u>nes</u> , 2019 at	9:15 am
Driller/	Helper:	Scott M	arino /Em	il Chob	ot					Date/Time Finis	hed:	_	Jun	e 28	, 2019 at	12:38 pm
Elevation	1: Grade ft	Vert	ical Datum	1: Nor C	oro Parrol	Bori	ng Location	: In front of 140	7 Piper Ave		Coo	rd.:	La	t: 42	.1462872	Long: -72.6466978
Туре		HW	San		-	Rig I	Make & Mod	el: Mobile B-5	3	Hammer Type	Dr	illin	g Flu	uid	Drill Ro	d Size:
Length Inside Di	a. (in.)	5 ft 3.25	2 f	't 75	-	Ti	uck 🗆 TV 🗆] Tripod] Geoprobe	Cat-Head	Safety			onite Der			Casing Advance
Hammer	Wt. (lb.)	140	140	0	-		ack	Air Track	Roller Bit		□ v	Vate	r			Mud Rotary
Hammer	Fall (In.)	30	30		-					<u> </u>	F	ield	Tes	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratu Graph	n ic Symb	S p ol	v cc optior	(Density/con onstituents, p nal descriptio	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretati	c cription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
	S-1	19	9			0.4	Top (5") - A	ASPHALT			-	-	-	-	PID = 0.0	PPM
_	0.0'- 2.0'		17 23		SM		Dense, bro (SM)	own coarse to f	ine SAND, little coarse Gra	avel, little Silt, dry						
			21													
-	0.0	40	04				Danas has								DD - 4 7	- 1.4
	5-2	16	24 21		SM		Gravel, dry	own coarse to r (SM)	ine SAND, some Silt, little	coarse to tine	-	-			PP = 1.7) PPM
-	2.0'- 4.0'		14													
			18													
-	S-3	11	15		SM		Verv dense	e brown coarse	PID = 0.0	PPM						
	4 0'- 6 0'		22			Very dense, brown coarse to fine SAND, some coarse Gravel, little Silt, dry (SM)										
5	4.0-0.0		51													
			44													
-	S-4	13	26		<u>.:</u> ML	6.0	Hard, brow	n SILT, some	coarse to fine Sand, little c	oarse Gravel, little	۰.	-	L	L	PP = 2.5	tsf
	6.0'- 8.0'		21				Clay, dry (I	ML)							PID = 0.0 Cobble o) PPM r boulder likely encountered
-			50/3												at 7 feet l	BGS.
-	S-5	24	10		ML		Very stiff, b	prown SILT, so	me fine Gravel, little coarse	e to fine Sand, dry	-	-	L	L	PP = 2.5	tsf
	8.0'- 10.0'		11				(ML)								PID = 0.0) PPM
-			14 15													
			10													
10	S-6	20	19		ML		Hard, brow	n SILT, little co	oarse Gravel, little coarse to	o fine Sand, dry	-	-	М	L	PP = 3.5	tsf
	10.0'-		17				(ML)									
-	12.0'		24 25													
-				1												
_																
[
15																
- 10	S-7	15	22		ML		Hard, brow	n Sandy SILT,	some coarse to fine Grave	el, dry (ML)	-	-	L	м	PP = 4.5	tsf
	15.0'- 17.0'		25 51													
	17.U		51													
L																
				ĻЦ		18.	5				_					
-				600	1											
				Po 0	\checkmark											
		Water Le	evel Data	LOC			Sampl	е Туре	Notes:			<u> </u>	I			
Det	T !	Elapsed	Dep	oth in f	et to:	0	Open Er	nd Rod	Groundwater not er	ncountered during	drilli	ng a	ctiv	ities	. Soils c	onsistent with glacial till
Date	Ime	(hr)	Bot. of Casing	of Ho	e Wate	г Т	Thin-Wa	all Tube	geology observed th	nrougnout boring.						
						Jυ	Undistur	bed Sample								
						SS	Split Spo	oon Sample								
						∃G	Grab Sa	mple							Boring N	o.: B-08
Field Te	st Leaena	l. d: Dila	itancy:	N -	None S	- Slov	/ R - Rapi	d	Plasticity: NP - N	on-Plastic L - Lov	w M	- M	ediu	ım	H - Hiah	
		Tou	ighness:	L - I	.ow M-	Mediu	ım H-Hig	gh	Dry Strength: N - Nor	ne L-Low M-N	Nediu	m	Η-	High	n VH-V	ery High
NOTES:	1.) "ppd" d 3.) Maximu	<u>enotes soil</u> um Particle	sample av Size is de	<u>/erage d</u> termined	ametral po	ocket p observ	enetrometer ation within I	reading. 2.) imitations of sa	"ppa" denotes soil sample ampler size. 4.) Soil iden	e average axial pocket atifications and field to	t pene ests b	etron aseo	<u>neter</u> d on	read visua	ding. al-manual i	methods per ASTM D2488.

MOT MAC	T DONAL	D M	м			SOIL BORING LOG						BORING NO.: B-08 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy H	Loughness	Plasticity	Dry Strength		Remarks
-	S-8 20.0'- 22.0'	1	31 50/3		GP	Very dense, brown coarse GRAVEL, dry (GP)	-	-	-	-		
	S-9 25.0'- 27.0'	18	47 51 63 50/3		GC	Very dense, brown coarse to fine GRAVEL, some Clay, dry (GC)	-	-	-	-		
	S-10 30.0'- 32.0'	18	37 48 55 50/4		CL	Hard, brown CLAY, some coarse to fine Gravel, dry (CL)	-	-	L	м	PP = 4.5	tsf
-						<u>33.5</u>						
— 35 —	S-11 35.0'- 37.0'	18	39 44 49 62		GC	Very dense, brown coarse to fine GRAVEL, some Clay, dry (GC) 37.0	-	-	-	-		
- 10						End of Boring at 37 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.						
-												
_ _ 45												
-												
							PRC 507	JE0 74(ст і 186	NO.: 636	6-002	BORING NO.: B-08
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian termined b	netral pock y direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket servation within limitations of sampler size. 4.) Soil identifications and field ter	oene sts ba	trom	eter I on	read visua	ding. al-manual	methods per ASTM D2488.

MOT	T DONAL	M	м					SOIL	BORING LO	G						BORING NO.: B-09 Page 1 of 2
Projec	t:	West S	pringfield	- Sewer	Expansio	n Pro	ject			Project No.:		_	507	4086	636-002	
Locatio	on:	West S	pringfield,	Massa	chussets					Project Mgr:		_	Eric	Pau	ıli	
Client:	•	Townsh	ip of Wes	st Spring	field					Field Eng. Staff	:	-	Cod	ly Ly	nes	0.50
Drilling	J CO.: Holpor:	Scott M	giano Boi arino /Em	il Chobe						Date/Time Star	tea:		Jun	e 27	, 2019 at	<u>8:52 am</u>
Elevation	1: Grade ft	Vert	ical Datum	1:		Borin	a Location	· Intersection of	f Piner Road and Alexande	ar Drive	Co	ord.:	La	t: 42	, <u>2013 at</u> .144457 L	.ong: -72.646289
Item		Casing	Sam	oler Co	re Barrel		.g				Но	rizor	tal D)atun	n: NAD 19	83
Type		HSA 5 ft		} +	-		Make & Mod	lel: Mobile B-5	3	Hammer Type		rillir Popt	g Flu	uid	Drill Ro	d Size:
Inside Di	a. (in.)	3.25	1.37	75	-		V E	Geoprobe	Winch	Doughnut		Polyr	ner			
Hammer	Wt. (lb.)	140	140)	-		ack 🗌	Air Track	Roller Bit	Automatic		Nate	er			Hollow Stern Auger
Hammer						<u> </u>		<u> </u>					I Te	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratun Graphi	n Group Symbo	S D D	CC optior	(Density/con (Density/con onstituents, panal description	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretati	c cription Name, noisture, ion, Symbol)	Dilotomoto	Toughness	Plasticity	Dry Strength		Remarks
_	S-1 0.0'- 2.0'	16	19 31 52		GW	0.3	Top (4") - A Very dense Sand, dry (ASPHALT e, brown coarse (GW)	e to fine GRAVEL, some c	oarse to fine			-	-	Likely su	obase material.
_	0.3-	10	43		\$ SW	2.0	Von/Dons	a brown coars	e SAND, some course to f	ine Gravel dry						
-	2.0'- 4.0'	13	31 26 18				(SW)	e, brown coars								
_ 5	S-3 4.0'- 6.0'	17	19 15 17 24		ML	4.0	Hard, brow	vn SILT, some o	PP= 1.75	tsf						
-	S-4 6.0'- 8.0'	20	26 13 30		ML		Hard, brow	vn SILT, little co	PP = 2.5	tsf						
-	S-5 8.0'- 10.0'	14	23 30 20		ML		Hard, brow	vn SILT, little co	PP = 1.0	tsf						
10 	S-6 10.0'- 12.0'	18	23 41 24 24 34		ML		Hard, brow	vn SILT, some o	PP = 2.0	tsf						
-						<u>13.5</u>	5				_					
	S-7 15.0'- 17.0'	20	14 21 31 27		CL		Hard, brow	vn CLAY, some	e coarse Gravel, moist (CL))			L	L	PP > 4.5	tsf
		Water Lo	evel Data	oth in fo	et to:	-	Sampl	e Type	Notes:	populatored during	d-:	inc		iti a -	Coil-	
Date	Time	Time	Bot. of	Botton	1 Water	<u></u>	Open Er	nd Rod	geology observed th	hroughout borina.	ariil	ing a	aC[IV	illes	. Solis co	onsistent with glacial till
ļ		(hr)	Casing	of Hole	e vvater	Ц.	I nin-Wa									
						-1	Undistur	bed Sample								
							Split Spo	oon sample								
						G	Grap Sa	ппріе							Boring N	o.: B-09
Field To	st Legen	l d: Dila	tancv:	IN N	lone S-	Slow	R - Rani	d I	Plasticity: NP - N	on-Plastic L-Lo	w N	1 - N	lediv	ım	H - Hiah	
			ighness:	<u> </u>	ow M - N	Mediu	m H - Hig	ghI	Dry Strength: N - Nor	ne L - Low M - I	Medi	um	H -	Hig	<u>1 VH -</u> V	ery High
NOTES:	1.) "ppd" d	enotes soi	I sample av	/erage dia	ametral po	cket pe	enetrometer	reading. 2.)	"ppa" denotes soil sample	average axial pocke	t pen	etror	nete	read	ling.	
	3.) Maximu	um Particle	Size is de	termined	by direct o	bserva	ation within I	limitations of sa	ampler size. 4.) Soil iden	ntifications and field f	ests	base	d on	visua	al-manual i	methods per ASTM D2488.

MOT MAC	T DONAL	D M	м			SOIL BORING LOG						BORING NO.: B-09 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity	Dry Strength		Remarks
-	S-8 20.0'- 22.0'	12	23 50/3		CL	Hard, brown CLAY, little coarse to fine Gravel, moist (CL)	-	-	L	L	PP > 4.5 Cobble o at 20.5 fe	tsf r boulder likely encountered wet BGS.
- 25 					CL	27.0					PP > 4.5	tsf
45 												
	1	<u> </u>	1	<u> </u>		F L	L PRO 507	JE0 7 4(і сті)86	1 NO. 536	5-002	BORING NO.: B-09
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian termined b	netral pock direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket p ervation within limitations of sampler size. 4.) Soil identifications and field tes	ts ba	trom	ieter I on	rea visu	ding. al-manual	methods per ASTM D2488.

MOT	T DONAL	м	м				SOIL	BORING LO	G						BORING NO.: B-10 Page 1 of 1
Projec	t:	West S	pringfield	Sewer I	Expansior	n Project			Project No.:		_5	5074	1086	36-002	
Locatio	on:	West S	pringfield,	Massac	hussets iold				Project Mgr: Field Eng. Staff		_ <u>E</u>	Eric Cod	Pau VIV		
Drilling	g Co.:	New En	gland Boi	ing					Date/Time Star	ted:		June	y∟y ∋28	, 2019 at	2:25 pm
Driller/	Helper:	Scott M	arino /Em	il Chobo	t				Date/Time Finis	shed:	_	June	e 28	, 2019 at	3:30 pm
Elevation	n: Grade ft	. Vert	ical Datum	l:	o Borrol	Boring Location: Inters	section of	Piper Road and Cynthia D	Drive	Coo	rd.:	La	t: 42	142883 L	ong: -72.645682
Туре		HSA	Sam		-	Rig Make & Model: M	obile B-53	3	Hammer Type	Dr	illing	g Flu	id	Drill Ro	d Size:
Length	a (in)	5 ft	2 f	t /5	- 6		od	Cat-Head	Safety		ento	nite			Casing Advance
Hammer	Wt. (lb.)	140	140)	- [Frack	Roller Bit		Ξv	/ater				Hollow Stem Auger
Hammer	Fall (in.)	30	30		- <u>I</u>	_ Skid		Cutting Head		I <u>M</u> N F	one ield	Tes	ete		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbol	Visual (Den constitu optional de	- Manua sity/consuents, pa scriptior	al Identification & Desc sistency, color, Group N article size, structure, m ns, geologic interpretation	c ription Name, noisture, on, Symbol)	Dilatancy -	Toughness	Plasticity	Dry Strength		Remarks
	S-1	16	7			0.5 Top (6") - ASPH/	ALT			-	-	-	-	PID = 0.0	PPM
L	0.0'- 2.0'		9 5		SP	Medium dense, dry (SP)	dark brow	n medium to fine SAND, tr	race fine Gravel,						
			6		·										
_															
	S-2	15	14 11		SP	Medium dense,	brown me	edium to fine SAND, dry (SI	P)	-	-	-	-	PID = 0.0	PPM
_	2.0'- 4.0'		11		.]										
			11		·										
L		10	10						2214						
	S-3	18	10 13		SP	SP Dense, light brown medium to fine SAND, trace coarse Gravel, dry (SP)									PPM
5	4.0'- 6.0'		17		·]										
			19		·										
F		40	47			Dance Kehther									
	5-4	19	17		. SP	Dense, light brov	wn tine SA	AND, trace fine Gravel, dry	(5P)	-	-	-	-	PID = 0.0	PPM
-	6.0'- 8.0'		22		·]										
			39		·										
-	8.5	3	60/4"			Van dansa brov		to fine SAND some coars	so Gravel dry						DDM
		5	00/4			(SP)	WII COAISE	to fine SAND, some coals	se Glavel, di y		-	[-	-	Cobble o	r boulder likely encountered
F	8.0'- 10.0'				.]									at 8 feet	365.
					·										
10	S-6	21	25		SP	Very dense, brow	vn coarse	to fine SAND little Silt_dr	v (SP)						
	10.0'	21	35						y (01)						
-	12.0'		62		.]										
			50/2"		÷										
-					·]										
					·										
F															
					·										
-					.]										
					÷										
15	S-7	20	31		SP	Very dense, brow	wn mediu	m to fine SAND, dry (SP)		-	-	-	-		
	15.0'-		54					,							
F	17.0'		50/3"												
F															
F	S-8	24	36	::::	SP	Very dense, fine	SAND, d	ry (SP)		-	-	-	-		
	18.0'-		52 64												
Γ	20.0'		50/4"		:	End of Poring at	20 fact P	GS							
						20.0 Borehole backfill	led with s	oil cuttings and restored wi	ith asphalt patch.						
		Water Le	evel Data	oth in fee	et to:	Sample Typ	be	Notes:	countered during	drilli-		-tiv#	tion		
Date	Time	Time	Bot. of	Bottom	Wator		nd he		countered auring	unni	iy ai	uvi	ues.		
		(hr)	Casing	of Hole	- valer		Sample								
						Split Spoon S	Sample								
						G Grab Sample									
						1								Boring N	o.: B-10
Field Te	st Legend	d: Dila Tou	itancy: ighness:	N - N L - Lo	one S- w M-N	Slow R - Rapid ledium H - Hiah	F	Plasticity: NP - No Dry Strength: N - Non	on-Plastic L - Lo ne L - Low M - I	w M Mediu	-M∉ m	ediu H -	m Hiał	H - High ℩ VH - ∿	ery High
NOTES:	1.) "ppd" d	enotes soi	sample a	erage dia	metral poc	ket penetrometer readi	ng. 2.)'	ppa" denotes soil sample	average axial pocke	t pene	trom	eter	read	ling.	, .
	3.) Maximu	um Particle	Size is de	termined t	by direct of	servation within limitati	ions of sa	mpler size. 4.) Soil ident	tifications and field t	ests b	ased	on	visua	I-manual	methods per ASTM D2488.

MOT	T DONAL	м	м					SOII	L BORING LO	G						BORING NO.: B-11
Projec	t:	West S	pringfield	- Sewer	Expansio	n Pro	ject			Project No.:		_	507	408	636-002	
Locati	on:	West S	pringfield,	Massac	hussets					Project Mgr:		_	Eric	Pa	uli	
Client:		Townsh	ip of Wes	st Spring	field					Field Eng. Staf	f: todi	-	Cod	y Ly	/nes 2010 at 10):50 am
Driller	Helper:	Scott M	arino /Em	il Chobo	t					Date/Time Finis	shed:	-	July	9, 1	2019 at 1	1:50 am
Elevatio	1: Grade ft	. Vert	ical Datum	1 :		Borin	g Locatior	1: On Piper Roa	d Between Jennifer Drive a	and Brice Road	Cod	ord.:	La	t: 42	2.1418204	Long: -72.6454327
Item Type		Casing	Sam	oler Co	e Barrel	Ria M	lake & Mor	1el· Mobile B-5	3	Hammer Type	Hor	izon rillin	tal D o Flu	atu	m: NAD 19	83 d Size:
Length		5 ft	2 f	t	-	🗹 Tr	uck [Cat-Head	Safety		Bento	onite			Casing Advance
Inside Di Hammer	a. (in.) Wt. (lb.)	3.25 140	1.37	75 D	-	🗆 AT 🗆 Tra	V ∐ ack [Geoprobe	Winch Roller Bit	Doughnut Automatic		Polyr Vate	ner r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	□ Sk	id []	Cutting Head			lone			,I	
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	1	ر optio	/isual - Manu (Density/con onstituents, p nal descriptio	al Identification & Descusion A Descusion	cription Name, noisture, ion, Symbol)	latancv -	ondhness	lasticity a	ry Strength		Remarks
	S-1	16	21			0.4	Top (5") -	ASPHALT				-	-	-		
	0.0'- 2.0'		41	°.°.°.°	\$ SW		Very dens	e, brown coars	e to fine SAND, little coarse	e to fine Gravel,						
F			16 11		۰ ٥		ury (377)									
					•	2.0										
-	S-2	18	7		SP		Medium d	lense, light brov	vn fine SAND, trace fine Gr	ravel, dry (SP)	-	-	-	-		
	2.0'- 4.0'		7													
-			8 7													
						SP Medium dense, light brown fine SAND, dry (SP)										
–	S-3	20	7		SP	Medium dense, light brown fine SAND, dry (SP)										
_	4.0'- 6.0'		8 10			SP Medium dense, light brown fine SAND, dry (SP)										
5			10													
L																
Γ	S-4	14	8		SP		Medium d	lense, brown co	parse to fine SAND, trace S	ilt, dry (SP)	-	-	-	-		
	6.0'- 8.0'		6													
Γ			8													
L																
	S-5	23	14		SP		Medium d	lense, light brov	vn coarse to fine SAND, dry	y (SP)	-	-	-	-		
L	8.0'- 10.0'		10													
			14													
10																
	S-6	15	13 18		SP		Very dens Gravel, dr	e, brown coars y (SP)	e to medium SAND, little co	oarse to fine	-	-	-	-	Cobble o at 11 fee	r boulder likely encountered BGS.
L	10.0'- 12.0'		60/4													
_					I											
-																
F																
15	6.7	22					Venidene	a light brown fi								
	5-7	22	33		, or		very dens	e, light brown li	ine SAND, dry (SP)		-	-	-	-		
-	15.0'- 17.0'		64													
			58													
╞																
╞																
F				·····	÷											
		Water L	evel Data		•1		Samp	le Type	Notes:			-	-	-	1	
Date	Time	Elapsed Time	Dep Bot of	oth in fe	et to:	0	Open E	nd Rod	Groundwater not en	ncountered during	drilli	ng a	ctiv	ties	i. –	
Date		(hr)	Casing	of Hole	Water	Т	Thin-W	all Tube								
					<u> </u>		Undistu	rbed Sample								
						155	Split Sp Grab Sc	oon sample								
						۲Ľ	GIAD Sã	ampie							Boring N	o.: B-11
Field Te	st Legen	d: Dila	atancy:	N - N	one S-	Slow	R - Rap	id «b	Plasticity: NP - No	on-Plastic L - Lo	w N	I - N	lediu	Im	H - High	(an I link
NOTES	1) "nnd" d	I OL	ignness:	L - L	W M - N	/iediu	m H - Hi	gn	Ury Strength: N - Nor	average avial pock			H -	Hig	n VH-∖ ding	ery High
	3.) Maximu	im Particle	Size is de	termined	by direct of	bserva	tion within	limitations of sa	ampler size. 4.) Soil iden	tifications and field	tests t	ase	d on	visu	al-manual	methods per ASTM D2488.

MOT MAC	T DONAL	M	м			SOIL BORING LOG						BORING NO.: B-11 Page 2 of 2	
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity Se L	Dry Strength		Remarks	
-	S-8 20.0'- 22.0'	24	12 30 28 42		SP	Very dense, brown fine SAND, dry (SP) 22.0 End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	-	-	-	-			
-													
_ _ 30													
-													
- 35													
-													
- 10													
-													
-													
NOTES:	1.) "ppd" d	enotes so	il sample av	verage dian	netral pock	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket	507	740	086	536	-002	B-11	
L	s.) Maximi	un Partici	e Size is de	remined p	y unect obs	servation within infinations of sampler size. 4.) Soli identifications and field tea	SIS Da	ased	100	visua	ar-manual	methous per ASTM D2488	o.

MOT	T DONAL	м	м				SOII	L BORING LO	G						BORING NO.: B-12 Page 1 of 2
Project	t:	West Sp	oringfield-	Sewer	Expansio	n Pro	oject		Project No.:		ţ	5074	4086	36-002	
Locatio	on:	West Sp	oringfield,	Massa	chussets				Project Mgr:		_[Eric	Pau	ıli	
Client:		lownsh	ip of Wes	t Spring	gfield				Field Eng. Staff	: hadi	_(Cod July	y Ly	nes 010 at 1:	10 pm
Driller/	Helper:	Scott Ma	arino /Em	il Chob	ot				Date/Time Start	shed:	_ <u>`</u>	Julv	9.2	019 at 1:	15 pm
Elevation	1: Grade ft	Vert	ical Datum	1:		Borir	ng Location: Near 1230 Pi	per Road		Coo	rd.:	La	t: 42	.1410955	Long: -72.6451032
Item		Casing	Samp	oler Co	ore Barrel	Dim	Value 9 Martale Multin D.S.		Lienen Trave	Hori	zont	al D	atun	n: NAD 19	83 d Since
Length		5 ft	2 f	t l	-	Tn Tr	uck D Tripod	Cat-Head	Safety		ento	nite	lia	Dhii Ro	Casing Advance
Inside Di	a. (in.)	3.25	1.37	'5	-		TV Geoprobe	Winch	Doughnut	ПР	olym	ner			Hollow Stem Auger
Hammer	Fall (in.)	30	30	,	-		kid <u> </u>	Cutting Head		M N	one				
	Sample						Visual - Manu	al Identification & Des	cription	F	ield	Tes	sts		
Depth/ Elev.	No. /	Rec.	Sample Blows	Stratu	n USCS		(Density/con	sistency, color, Group I	Name,	~	SSE	5	ngth		Remarks
(ft)	Interval (ft)	(in)	per 6"	Graph	Symbo	1	constituents, p optional descriptio	article size, structure, n ns, geologic interpretati	noisture, ion, Symbol)	atanc	nghne	asticit	y Stre		
	<u> </u>	16	21			_			, ,	ā	Ļ	ä	۵,		
		10	17	°, °, °, °	* SW/	0.5	Medium dense, brown co	area to fine SAND some o	coarse to fine		[.	⁻	-		
-	0.0-2.0		12				Gravel, dry (SW)	Jaise to line SAND, some t	Juarse to fille						
			6		•										
-	S-2	11	6	• • • • • • • •	* ··· SP	2.0	Medium dense light brow	wn coarse to fine SAND tra	ce fine Gravel						
			7				dry (SP)								
-	2.0'- 4.0'		7												
			18												
-	63	16	18		SD SD		Madium dansa, brown fin	o SAND little Silt day (SP)	\						
		10	10)			-			
	4.0'- 6.0'		11												
			11		4										
-	S /	12	16		SM	6.0	Medium dense, brown fin	A SAND some Silt moist	(SM)	_					
	0-4	12	13				mediam dense, brown m	ie SAND, some Sin, moist	(3111)		[.	⁻	-		
-	6.0-8.0		12												
			15												
-	85	4	14			8.0	Medium dense, brown co	arse to fine SAND, some o	coarse to fine						
	3-5	4	14				Gravel, moist (SP)	Jaise to line SAND, some o	coarse to fine	-	-	-	-		
-	8.0'- 10.0'		12												
			15												
10	S-6	20	11		:- MI	10.0	0 Verv stiff brown SILT mo	oist (ML)		-		.		PP = 0.5	tsf
	10.0	20	10									-	-	11 0.0	
-	12.0'		12												
			16												
-															
-															
-															
1 \$	S-7	20	4		ML		Stiff, brown SILT, wet (MI	L)		_	-	L		Ground w	ater inferred at 15 feet
	15.0'-		5				,	,				[-	BGS. PP = 0.5	tsf
┣ │	17.0'		8											0.3	
			11												
F															
F															
F															
		Water Le	evel Data		-		Sample Type	Notes:			1	1			
Data	Timo	Elapsed	Dep Bot of	oth in fe	et to:	-0	Open End Rod	Groundwater inferr	red at 15 feet B	GS.	So	oils	con	sistent w	vith glacial till geology
Date		(hr)	Casing	of Hol	Water	Т	Thin-Wall Tube		at bornig.						
7/9/19	13:50	-	20.0	22.0	15	U	Undisturbed Sample								
						SS	Split Spoon Sample								
						G	Grap Sample							Boring N	o.: B-12
Field Te	st Legend	d: Dila	tancy:	N - 1	None S-	Slow	/ R - Rapid	Plasticity: NP - No	on-Plastic L - Lo	w M	- M	ediu	ım	– H - High	
	.	Tou	ghness:	L - L	.ow M-N	/lediu	ım H-High	Dry Strength: N - Nor	ne L-Low M-N	Mediu	m	H -	Higł	n VH-ĭV	ery High
NOTES:	1.) "ppd" d 3.) Maximu	enotes soil ım Particle	sample av Size is de	<u>erage di</u> termined	ametral poo by direct o	ket pe bserva	enetrometer reading. 2.) ation within limitations of sa	"ppa" denotes soil sample ampler size. 4.) Soil iden	average axial pocke tifications and field t	t pene ests b	trom ased	eter I on	reac visua	ling. Il-manual i	methods per ASTM D2488.

MOT MAC	T DONAL	м	м									BORING NO.: B-12 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity	Dry Strength		Remarks
_	S-8 20.0'- 22.0'	24	6 6 8 11		ML	Stiff, brown SILT, some fine Sand, moist (ML)	-	-	L	L	PP = 1.0	tsf
-						22.0 End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.						
-												
-												
— 30 —												
-												
- 35												
-												
-												
40 												
-												
- 45												
-												
PROJECT NO.: BORIT 507408636-002 B-12												BORING NO.: B-12
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particle	il sample av e Size is de	verage dia termined b	metral pock by direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket servation within limitations of sampler size. 4.) Soil identifications and field te	pene sts b	trom	eter I on	rea visu	ding. al-manual	methods per ASTM D2488.

MOT	T DONAL	D M	м					SOIL	BORING LO	G						BORING NO.: B-13 Page 1 of 2
Projec	t:	West S	pringfield	- Sewer	Expansio	n Pro	ject			Project No.:		_{	5074	4086	36-002	
Locati	on:	West S	pringfield,	Massac	hussets					Project Mgr:		_[Eric	Ραι	ıli	
Client:		Townsh	ip of Wes	st Spring	field					Field Eng. Staf	f:	_(<u>Cod</u>	y Ly	nes	
Drilling	g Co.: /Llainari	New En	giand Boi orino /Em	il Choho	+					Date/Time Star	ted:		July	12,	2019 at 2019 at 2019 at 2019 at 2019	::30 pm
Elevation	neiper. n: Grade ft	Vert	ical Datum	n:		Borir	a Location	. Intersection of	Bruch Hill and Ealyev St	Date/Time Finis	Coo		La	t: 42	1423057	Lona: -72.641108
ltem	-	Casing	Sam	oler Co	e Barrel						Hori	zont	al D	atun	n: NAD 19	83
Type		HSA 5 #		3 +	-		lake & Moo	lel: Mobile B-5	3	Hammer Type	Dr	illing	g Flu	lid	Drill Ro	d Size:
Inside Di	a. (in.)	3.25	1.37	75	-			Geoprobe	Winch	Doughnut		olym	ner			
Hammer	Wt. (lb.) Fall (in)	140 30	140	0	-	∏ Tra	ack [Air Track	Roller Bit	Automatic		/ater	r			Hollow Stern Auger
Tidifiifiei										·	F	ield	Tes	sts		
Depth/ Elev. (ft)	No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	1	co option	(Density/con: (Density/con: onstituents, panal description	al Identification & Desc sistency, color, Group N article size, structure, m ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
	S-1	24	30			0.5	Top (6") -	ASPHALT			-	-	-	-	PID = 0.0	PPM
	0.0'- 2.0'		44		\$ SW		Very dens	e, brown coarse	e to fine SAND, little coarse	e Gravel, dry						
-			23		•		(511)									
					•											
-	S-2	18	19		sw		Medium d	ense, brown co	arse to fine SAND, dry (SW	V)	-	-	-	-	PID = 0.0	PPM
	2.0'- 4.0'		14		•											
F			13 13		* *											
					•											
F	S-3	13	21		sw		Medium d	ense, brown co	arse to fine SAND, dry (SW	V)	-	-	-	-	PID = 0.0	PPM
	4.0'- 6.0'		8		°,											
			9		*											
			10		•											
╞	S-4	21	11		sw		Medium d	ense, brown co	arse to fine SAND, trace fir	ne Gravel, dry	-	-	-	-	PID = 0.0	PPM
	S-4 21 11 b * * * * * S SW Medium dense, brown coarse to Tine SAND, trace Tine Gravel, dry (SW)															
╞			11		•											
			12		•											
-	S-5	17	8		SP	8.0	Medium d	ense, brown co	arse to fine SAND, dry (SP	·)		-	-	_	PID = 0.0	PPM
	8 0'- 10 0'		11					*		,						
╞	0.0 - 10.0		16													
			18													
10	S-6	18	17		SP		Dense br	own coarse to fi	ine SAND, dry (SP)				١.			
	10.0	10	14				Donioo, bi									
\vdash	12.0'		18													
			16													
-																
-																
-																
15	87	22	11				Medium d	ense brown co	area to fine SAND dry/SP	2						
	15.01	~~	11	·				onse, brown co	and to me onind, any (or	/		⁻	⁻			
╞	15.0'-		13													
			15													
╞																
╞																
╞				· · · · ·												
					:]											
		Water Lo	evel Data	<u> · · · · · ·</u>	·I	+	Samn	le Type	Notes:				I			
	- .	Elapsed	De	oth in fe	et to:	0	Open E	nd Rod	Groundwater not en	ncountered during	drillir	ig a	ctivi	ties.		
Date	Time	Time (hr)	Bot. of Casing	Bottom	Water	Т	Thin-W	all Tube								
		()				U	Undistu	rbed Sample								
						ss	Split Sp	oon Sample								
						G	Grab Sa	ample							Boring N	0 · B_13
Field To	et Locor	 d• Dila	tancy:			Slow	R - Pan	id 1	Plasticity: ND NZ	on-Plastic L	M/ N/	- 14	odiu	ım		~~ U-IJ
	ar redeu		ighness:	<u> </u>	<u>w M</u> -N	<u>lediu</u>	m <u>H</u> -Hi	gh I	Dry Strength: N - Nor	ne <u>L-Low</u> M-	Mediu	m	H -	High	<u>1 VH</u> - V	ery High
NOTES:	1.) "ppd" d	enotes soi	sample a	/erage dia	metral poo	ket pe	enetrometer	reading. 2.)	"ppa" denotes soil sample	average axial pocke	et pene	trom	eter	read	ling.	
	3.) Maximu	um Particle	Size is de	termined	by direct ol	bserva	ation within	limitations of sa	ampler size. 4.) Soil iden	tifications and field	tests b	ased	i on	visua	al-manual i	methods per ASTM D2488.

MOT MAC	T DONAL	D M	м			SOIL BORING LOG						BORIN B- Page	IG NO.: -13 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness plai	Plasticity Bal	Dry Strength		Remarks	;
-	S-8 20.0'- 22.0'	18	11 29 38 44		SP	Very dense, brown coarse to fine SAND, dry (SP) 22.0 End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	-	-	-	-			
-													
-													
- 35													
-													
-													
- 							PRC 507) JE0 740	от п 1 то 186	NO.: 336	-002	BORING NO	D.:
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian termined by	netral pock y direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket servation within limitations of sampler size. 4.) Soil identifications and field ter	pene sts ba	trom ased	eter on	read visua	ing. I-manual I	l methods per A	STM D2488.

MOT	T DONAL	м	м				SOIL	BORING LO	G						BORING NO.: B-14
Projec	t:	West S	pringfield	- Sewer	Expansio	n Pro	oject		Project No.:			5074	4086	36-002	
Locati	on:	West S	pringfield,	Massa	chussets				Project Mgr:			Eric	Pau	li	
Client:		Townsh	ip of Wes	st Spring	field				Field Eng. Staff	:	_(<u>Cod</u>	y Lyr	nes	
Drilling	g Co.:	New En	gland Boi	ring					Date/Time Start	ed:	_	July	16,	2019 at 8	3:15 am
Elevation	Heiper:	Vert	ical Datum	n:	DI I	Porin	a Location: In front of 450		Date/Time Finis	Coo	<u>'</u>	La	10, t: 42	2019 at s	Long: -72 6433182
Item	orado n	Casing	Sam	oler Co	re Barrel	Bonn	ig Location. In none of 409	Diusii i iii Ave		Hori	zon	al D	atum	1: NAD 19	83
Type		HSA 5.#	SS	} +	-		Make & Model: Mobile B-5		Hammer Type	Dr	illing	g Flu	uid	Drill Ro	d Size:
Inside Di	a. (in.)	3.25	1.37	75	-		TV Geoprobe	☐ Cal-Head	Doughnut		olym	nite ner			
Hammer	Wt. (lb.)	140	140	0	-		ack 🗌 Air Track	Roller Bit	Automatic		/ate	r			Hollow Stem Auger
Hammer	Fail (in.)	30	30		- 1	<u></u> 					<u>one</u> ield	Tes	sts	I	
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratur Graphi	n Group Symbo	;))	Visual - Manua (Density/cons constituents, pa optional description	al Identification & Desc sistency, color, Group N article size, structure, m ns, geologic interpretation	cription Name, noisture, ion, Symbol)	Dilatancy .	Toughness	Plasticity	Dry Strength		Remarks
	S-1	13	2		SW		Medium dense, brown co	arse to fine SAND, little coa	arse to fine	-	-	-	-		
	0.0'- 2.0'		5				Glavel, dry (SW)								
F			24		`										
-	S-2	15	12		sw sw		Medium dense, brown co	arse to fine SAND, trace co	oarse Gravel, dry	-	-	-	-		
	2.0'- 4.0'		9		`		(SW)								
F			9												
					°.										
F	S-3	13	10		sw		Medium dense, brown co	arse to fine SAND, little fine	e Gravel, dry	-	-	-	-		
	4.0'- 6.0'		6		`		(SW)								
			6		.										
			0		•	6.0									
-	S-4	18	7		SP	0.0	Medium dense, brown co	arse to fine SAND, little fine	e Gravel, dry (SP)	-	-	-	-		
	S-4 18 7 SP Medium dense, brown coarse to fine SAND, little fine Gravel, dry (SP) - - - 6.0'- 8.0' 8 SP Medium dense, brown coarse to fine SAND, little fine Gravel, dry (SP) - - - -														
F			8												
			0												
F	S-5	19	4		SP		Medium dense, brown co	arse to fine SAND, dry (SP	')	-	-	-	-		
	8.0'- 10.0'		5												
F			6												
10	S-6	20	6		SP		Medium dense, brown me	edium to fine SAND, trace \$	Silt, dry (SP)	-	-	-	-		
	10.0'-		7												
-	12.0'		7												
-															
-															
Γ															
- 15															
	S-7	20	8		SP		Medium dense, brown coa	arse to fine SAND, dry (SP	')	-	-	-	-		
L	15.0'-		7	·····											
	11.0		7												
L				: · · · ·	::										
L															
F				·····											
		Watarl	Wol Det-			_	Sample Ture	Notos:							
<u> </u>		Elapsed	Data	<u>oth in f</u> e	et to:		Open End Rod	Groundwater not en	ncountered during	drillir	ig a	ctivi	ties.		
Date	Time	Time	Bot. of	Botton	Water	T	Thin-Wall Tube		9		5-				
		(117)	casing		*	υ	Undisturbed Sample								
						ss	Split Spoon Sample								
						G	Grab Sample							Dorin - M	D 44
		4. D"		N .			D Derid		an Diactic 1			o d'			⁰ D-14
Field Te	st Legend	a: Dila Tou	aancy: Ighness:	N - M L - L	wone S- ow M-N	Siow Nediu	ик-каріо І ım H-High [Plasticity: NP - No Dry Strength: N - Nor	ne L-Low M-N	w M Mediu	- M m	eaiu H -	ım High	n - High VH - V	′ery High
NOTES:	1.) "ppd" d	enotes soi	sample av	/erage dia	ametral poo	cket pe	enetrometer reading. 2.)	"ppa" denotes soil sample	average axial pocke	t pene	trom	neter	read	ing.	
	3.) Maximu	ım Particle	Size is de	termined	by direct o	bserva	ation within limitations of sa	ampler size. 4.) Soil ident	tifications and field t	ests b	asec	lon	visua	l-manual	methods per ASTM D2488.

MOT MAC	T DONAL	.D M	м			SOIL BORING LOG						BORING NO.: B-14 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity Blasticity	Dry Strength		Remarks
-	S-8 20.0'- 22.0'	23	10 14 13 15		SP	Medium dense, light brown coarse to fine SAND, dry (SP)	-	-	-	-		
25 	S-9 25.0'- 27.0'	19	13 21 26 22		SP	Dense, brown fine SAND, dry (SP)	-	-	-	-		
- 30 - 30 35 						End of Boring at 27 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.						
							PRC 507	JE0 74(ст і 086	NO.	5-002	BORING NO.: B-14
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian termined b	netral pock y direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocke servation within limitations of sampler size. 4.) Soil identifications and field to	t pene ests b	trom asec	ietei I on	r rea visu	ding. al-manual	methods per ASTM D2488.

MOT	T DONAL	м	м					SO	IL	BORING LO	G							BORING NO.: B-15
Projec Locatio	t: on:	West S West S	pringfield pringfield	- Sewer I , Massac	Expansion hussets	n Proj	ect				Pr Pr	oject No.: oject Mgr:		_	5074 Eric	4086 Рас	636-002 Jli	Page 1 of 1
Client:		Townsh	ip of Wes	st Spring	field						Fi	eld Eng. Staf	f: todi	_	Cod	<u>y Ly</u>	nes 2010 at 2	2:50 pm
Driller/	Helper:	Scott M	arino /Em	nil Chobo	t						Da	ate/Time Star	shed:		July	11,	2019 at 3	3:52 pm
Elevation	n: Grade ft	. Vert	ical Datun	n:		Boring	g Location	n: In front of 19	9 Apr	ricot Hill Lane			Coc	rd.:	La	t: 42	.1461679	Long: -72.6543742
Item Type		Casing HSA	Sam	pler Con	e Barrel	Ria M	ake & Mo	del: Mobile B	-53		TF	lammer Type	Hor	izon illin	<u>tal D</u> α Flι	atur Jid	n: NAD 19 Drill Ro	83 d Size:
Length		5 ft	2 f	it 👘	-	Tru	ck [Ĩ	Cat-Head		Safety		ento	onite			Casing Advance
Hammer	<u>a. (ın.)</u> Wt. (lb.)	3.25	1.3	0	-	⊔ A⊓ □ Tra	v L ick [☐ Geoprobe ☐ Air Track		Roller Bit		Doughnut Automatic		'olyn Vate	ner r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	□ Ski	d [Cutting Head				lone	-			
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	4	c optio	Visual - Man (Density/co constituents, onal descripti	nual onsis part ions	Identification & Des stency, color, Group I ticle size, structure, n , geologic interpretati	scrip Narr mois tion,	tion ne, ture, Symbol)	Dilatancv	Toughness	Plasticity	Dry Strength		Remarks
-	S-1 0.0'- 2.0'	18	21 24 40 24		\$SW	2.0	Top (3") - Very dens dry (SW)	Asphalt se, brown coar	rse to	o fine SAND, some coar	irse to	o fine Gravel,		-	-	-	PID = 0.0	PPM
-	S-2 2.0'- 4.0'	19	53 20 12 11		CL-ML		Hard, darl Gravel, dr	k brown Claye ry (CL-ML)	ey SIL	T, some coarse to fine	Sand	d, trace fine	-	-	L	L	PP = 1.5 PID = 0.0	tsf) PPM
	S-3 4.0'- 6.0'	15	7 10 11 52		CL-ML Very stiff, dark brown Clayey SILT, little coarse to fine Gravel, dry (CL-ML) 6.0 6.0 GP Dense, light gray coarse to fine GRAVEL, some coarse Sand, dry													tsf) PPM
-	S-4 6.0'- 8.0'	4	33 19 16 14		6.0 GP Dense, light gray coarse to fine GRAVEL, some coarse Sand, dry -												PID = 0.0	РРМ
-	S-5 8.0'- 10.0'	8	14 23 37 66		SM	8.0 SM Very dense, dark brown Silty coarse to fine SAND, little fine Gravel, dry (SM) L L L PP										PP = 1.0 PID = 0.0	tsf) PPM	
- 10	S-6 10.0'- 12.0'	9	80 58 45 43		SP	13.5	Very dens	se, brown coar	rse to	o fine SAND, some fine	Grav	rel, dry (SP)		-	-	-		
	S-7 15.0'- 17.0'	8	24 21 18 20		CL	17.0	Hard, bro	wn CLAY, son	ne co	parse to fine Gravel, moi	bist (C	SL)	-	-	м	L	PP = 0.5	tsf
-							End of Bo Borehole	oring at 17 feet backfilled with	t BGS h soil	S. I cuttings and restored w	with a	asphalt patch.						
		Water Le	evel Data				Samp	ole Type		Notes:								
Date	Time	Elapsed Time	De Bot. of	bth in fee Bottom	et to:	-0-	Open E	Ind Rod		Groundwater not er geology observed th	encou throu	untered during ahout boring	g drilli	ng a	ctiv	ities	. Soils co	onsistent with glacial till
		(hr)	Casing	of Hole	Water	1.	Thin-W	all Tube		300.039 0000 Wu		.a. sat soring.						
						1.	Undistu	urbed Sample	e									
						188	Grah Q	ample	"									
						۲Ľ	GIAD S	ample									Boring N	o.: B-15
Field Te	st Legen	d: Dila	tancy:	N - N	one S-	Slow	R - Rap	pid	Pla	asticity: NP - N	lon-F	Plastic L - Lo	w M	- M	ediu	Im	H - High	
NOTES	4 \ !! !!! .	Tou	ighness:	L - Lo	w M-N	/lediur	n H-Hi	igh	Dr <u>.</u>	y Strength: N - Nor	one	L - Low M -	Mediu	Im	H -	Hig	h VH-V	ery High
NUTES:	3.) Maximu	enotes soi um Particle	sample av Size is de	verage dia termined l	netral poc by direct of	servat	netromete tion within	limitations of	<u>.) "p</u> sam	pa denotes soil sample pler size. 4.) Soil iden	e ave ntifica	age axial pock	et pene tests b	ased	ieter d on	read visua	al-manual r	nethods per ASTM D2488.

MOT	T DONAL	M	м					SOI	BORING LO	G						BORING NO.: B-16
Project	t:	West S	oringfield-	Sewer E	xpansio	n Pro	ject			Project No.:		_	5074	1086	36-002	Page 1 01 1
Locatio	on:	West S	oringfield,	Massac	nussets					Project Mgr:		_	Eric	Pau	lli	
Client:		lownsh New En	ip of Wes aland Bor	<u>ing</u>	ield					Field Eng. Staff	: od:	_	Cod July	<u>y Ly</u> i 12	nes 2019 at 8	9·10 am
Driller/	Helper:	Scott M	arino /Em	il Chobot						Date/Time Finis	hed:	_	July	12,	2019 at 9):20 am
Elevation	1: Grade ft	. Vert	ical Datum	:		Borin	g Location	: In front of 65	Apricot Hill Lane		Coo	rd.:	La	t: 42.	1462434	Long: -72.6528347
Item Type		Casing HSA	Samp SS	oler Cor	e Barrel	Rig N	lake & Mod	el: Mobile B-5	3	Hammer Type	Hori	izon illin	al D g Flu	atun iid	1: NAD 19 Drill Ro	83 d Size:
Length	a (im)	5 ft	2 fl	t	-	Tn	uck [Tripod	Cat-Head	Safety	E	ento	nite			Casing Advance
Hammer	a. (in.) Wt. (lb.)	3.25 140	1.37	5)	-		v L ack D	Geoprobe Air Track	Roller Bit	Automatic		'oiyn Vate	ner r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-		id 🗌]	Cutting Head			lone	То	te		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo		V cc optior	isual - Manu (Density/con onstituents, p nal descriptio	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
	S-1	14	14			0.4	Top (5") - A	ASPHALT			-	-	-	-		
_	0.0'- 2.0'		23 31		GW		Very dense Sand, dry (e, brown coars (GW)	e to fine GRAVEL, some co	oarse to fine	-	-	-	-	Likely sul	base material.
	0.4'-'		26													
-		40	20		014/	2.0	Mana dana				_					
	5-2	10	30		500		dry (SW)	e, brown coars	e to line SAND, some coar	se to line Gravel,	-	-	-	-		
-	2.0'- 4.0'		28													
	23 4.0 S-3 9 25 0 GP Very dense, brown coarse to fine GRAVEL, some coarse to fine - -															
-	S-3 9 25 GP Very dense, brown coarse to fine GRAVEL, some coarse to fine - - - 4.0'-6.0' 35 0 - - - -															
	4.0'- 6.0'		35	0°			Sand, dry	(GP)								
5	$5 \qquad 4.0^{\circ}-6.0^{\circ} \qquad 35 \qquad 0 \qquad 0 \qquad Sand, dry (GP)$															
-	S-4	15	48		GP		Very dense	e, brown coars	e to fine GRAVEL, some co	oarse Sand, dry	-	-	-	-		
	6.0'- 8.0'		50 54	°0 C	,											
			59	0°												
-		10		60												
	S-5	12	34 45		GP		Very dense moist (GP)	e, brown coars)	e to fine GRAVEL, little coa	arse to fine Sand,	-	-	-	-		
-	8.0'- 10.0'		26		1											
			32	,0 C	,											
10	S-6	7	26	$\sim \sim \sim$	SP	10.0	Very dense	e, brown Grave	lly coarse to fine SAND, tra	ace Silt, moist	۰.	-		_		
	10.0'-		34		·		(SP)			·						
-	12.0'		40 28													
∇			-		1											
					1											
_																
					<u> </u>	13.5	<u> </u>				_					
-					1											
					•											
15	S-7	14	21		GW		Dense. bro	own coarse to f	ine GRAVEL. little coarse t	to fine Sand. wet	-	.	_	_		
	15.0'-		25				(GW)		,							
-	17.0'		16 14]											
			14		1	17.0)									
							End of Bor	ing at 17 feet E	BGS.	vith asphalt natch						
							Dorenole L	ACTINET MILLS	on outings and residied w	nai aopilan paton.						
-																
		Water Le	evel Data		L	+	Sampl	e Type	Notes:			1				
Data	Time	Elapsed	Dep	th in fee	t to:	0	Open Er	nd Rod	Groundwater inferre	ed at 12 feet BGS.						
Date	Ime	(hr)	Bot. of Casing	воttom of Hole	Water	т	Thin-Wa	all Tube								
7/12/19	9:15	-	15.0	17.0	12	-lu	Undistur	bed Sample								
				-		⁵⁵	Split Spo Grab Sa	oon sample								
						٦Ľ		pio							Boring N	D.: B-16
Field Te	st Legen	d: Dila	tancy:	N - N	one S-	Slow	R - Rapi	d th	Plasticity: NP - No	on-Plastic L - Lov	w M	- M	ediu u	im Hiat	H - High	erv High
NOTES	h "baa" (.1	I OU enotes soil	sample av	L - LO	netral no	vieulu cket pe	enetrometer	reading. 21	y Suengun. IN - INOr "ppa" denotes soil sample	average axial nocke	t pene	etron	rt - neter	read	i v n - V lina.	сі у Піўн
	3.) Maximu	Im Particle	Size is det	ermined b	y direct o	bserva	tion within I	imitations of sa	ampler size. 4.) Soil iden	tifications and field t	ests b	ased	lon	visua	Il-manual I	nethods per ASTM D2488.

MOT	T DONAL	м	м				SOIL	BORING LO	G						BORING NO.: B-17 Page 1 of 2
Projec	t:	West S	pringfield	- Sewer	Expansio	n Pro	oject		Project No.:		-	507	408	<u>336-002</u>	
Location Client:	on:	West S Townsh	pringfield, ip of Wes	<u>Massac</u> st Spring	<u>hussets</u> field				Project Mgr: Field Eng. Staff		-	Eric Coc	<u>: Pau</u> lv Lv	uli mes	
Drilling	g Co.:	New En	gland Bo	ring					Date/Time Start	ed:	-	July	<i>i</i> 10,	2019 at a	8:10 am
Driller/ Elevation	Helper:	Scott M	arino /Em ical Datum	il Chobo 1:	ot	Borin	ng Location: In front of 33	ennifer Drive	Date/Time Finis	hed	ord.:	July La	/ 10, it: 42	2019 at	10:15 am Long: -72.6468158
Item	ender n	Casing	Sam	oler Co	re Barrel	Donn	Nelse 2 Martele Martele D 50 50			Ho	izor	ntal [Datur	n: NAD 19	983 1 0
Length		5 ft	2 f	t	-	Tn Tr	uck D Tripod	Cat-Head	Safety		Bent	onite	ua	Drill Ro	Casing Advance
Inside Di Hammer	a. (in.) Wt. (lb.)	3.25 140	1.37	75 D	-	🗆 AT 🗆 Tra	TV 🛛 Geoprobe rack 🗌 Air Track	Winch Roller Bit	Doughnut Automatic		Poly Nate	mer er			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	□ Sk	kid 🗌	Cutting Head			None Field) 1 Te	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratun Graphi	Group Symbo		Visual - Manua (Density/cons constituents, pa optional description	al Identification & Dese sistency, color, Group N article size, structure, m ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilotonov	Tolinhness	Plasticity	Dry Strength		Remarks
_	S-1 0.0'- 2.0'	15	11 13 13 10		\$ \$	0.3	_ Top (3") - ASPHALT Medium dense, brown coa Gravel, dry (SW)	arse to fine SAND, little co	arse to fine			-	-		
-	S-2	12	21		SP	2.0	Dense, brown coarse SAN	ND, some coarse to fine G	ravel, dry (SP)	-		-	.		
-	2.0'- 4.0'		21 21 21		4.0 GP Dense, brown coarse to fine GRAVEL, some coarse Sand, dry (GP)										
5	S-3 4.0'- 6.0'	16	8 18 27 28		GP										
-	S-4	18	26 SP Very dense, brown coarse to fine SAND, some coarse to fine Gravel, dry (SP) -												
_	6.0'- 8.0'		38 31												
-	S-5 8.0'- 10.0'	16	18 22 20 25		SP		Dense, brown coarse SAN								
— 10 —	S-6 10.0'- 12.0'	15	38 33 46 40		SP		Very dense, reddish browr Gravel, little Clay, dry (SP)	n coarse to fine SAND, sor)	me coarse to fine			-	-		
- 15															
-	S-7 15.0'- 17.0'	0	50/0		SP		No Recovery - Assumed tr Very dense, reddish browr Gravel, little Clay, dry (SP)	o be: n coarse to fine SAND, soi)	me coarse to fine	-		-	-	Cobble o at 15 fee	r boulder likely encountered t BGS.
-							Orani T	- Mater							
		Water Lo Elapsed	evel Data Der	oth in fe	et to:	0	Sample Type Open End Rod	Notes: Groundwater not er	ncountered during	drill	ng	activ	ities	. Soils c	onsistent with glacial till
Date	Time	Time (hr)	Bot. of Casing	Bottom of Hole	Water	Т	Thin-Wall Tube	geology observed th	nroughout boring.		3				J
		,	- song		-	U	Undisturbed Sample								
						- ss	Split Spoon Sample								
						- 6	Sample							Boring N	lo.: B-17
Field Te	st Legen	d: Dila	atancy:	N - N	lone S-	Slow	v R - Rapid P	Plasticity: NP - No	on-Plastic L - Lo	w N	1 - N	ediر العا	um ⊔i~'	H - High	/en/ High
NOTES:	1.) "ppd" d	enotes soi	ignness: I sample av	L - L	ametral poc	ket pe	enetrometer reading. 2.)	iy סוופרוקעדו. א - NOr ppa" denotes soil sample"	average axial bocke	t pen	un etro	nete	r read	u v⊓-V ding.	с у піўн
	3.) Maximu	Im Particle	Size is de	termined	by direct of	bserva	ation within limitations of sa	mpler size. 4.) Soil iden	tifications and field t	ests l	base	d on	visua	al-manual	methods per ASTM D2488.

MOT MAC	T DONAL	M	м			SOIL BORING LOG						BORING B- Page 2	G NO.: 17 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity BaL	Dry Strength		Remarks	
-	S-8 20.0'- 22.0'	3	50/2		SP	Very dense, brown fine SAND, some coarse Gravel, little Clay, dry (SP) 22.0	-	-	-	-			
-						End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.							
25													
-													
_													
-													
- 35													
-													
-													
40 													
-													
-							PRC			NO.:		BORING NC).:
NOTES:	TES: 1) "ppd" denotes soil sample average diametral pocket penetrometer roading 2) "ppe" denotes soil cample average avial pocket penetrometer roading												
	3.) Maximu	um Particl	e Size is de	termined b	y direct obs	servation within limitations of sampler size. 4.) Soil identifications and field te	sts b	ased	lon	visual	-manual ı	methods per AS	STM D2488.

MOT		M	м				SOIL	BORING LO	G						BORING NO.: B-19	
Projec	t:	West S	pringfield-	- Sewer E	xpansio	n Pro	ject		Project No.:			507	4086	36-002	Page 1 of 1	
Locati	on:	West S	pringfield,	Massach	nussets				Project Mgr:		_	Eric	Pau	lli		
Client:		Townsh	ip of Wes	t Springf	ield				Field Eng. Staff:	a de		Cod	y Lyı	<u>nes</u> 2010 at	10:30 am	
Driller/	Helper:	Scott M	arino /Em	il Chobot					Date/Time Finis	eu. hed:	-	Jun	e 24	, 2019 at	11:23 am	
Elevation	1: Grade ft	. Vert	ical Datum	:		Borin	g Location: Near 26 Heml	lock Hill Road		Coc	rd.:	La	t: 42.	13986 Lo	ng: -72.65201	
Item Type		Casing HSA	Samp	oler Cor	e Barrel	Ria N	lake & Model: Mobile B-5	3	Hammer Type	Hor	izon rillin	tal D o Flu	atum Jid	n: NAD 19	83 d Size:	
Length		5 ft	2 f	t	-	Tr.		Cat-Head	□ Safety		Bento	onite			Casing Advance	
Inside Di Hammer	a. (in.) Wt. (lb.)	3.25 140	1.37	75 D	-	∐ AT □ Tra	V ∐ Geoprobe ack ☐ Air Track	✓ Winch ✓ Roller Bit	☐ Doughnut ☑ Automatic		Polyn Vate	ner r			Hollow Stem Auger	
Hammer	Fall (in.)	30	30		-	□ Sk	id 🗌	Cutting Head			lone	T	. 1			
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	1	Visual - Manu (Density/con constituents, pr optional description	al Identification & Desc sistency, color, Group N article size, structure, m ns, geologic interpretati	cription Name, noisture, on, Symbol)	Dilatancv	Toughness	Plasticity	Dry Strength		Remarks	
_	S-1 0.0'- 2.0'	18	15 8 9 7		SP ·	0.2	Cop (2") - ASPHALT Medium dense, dark brov little Silt, dry (SP)	vn fine SAND, some coarse	e to fine Gravel,	-	-	-	-			
-	S-2 2.0'- 4.0'	24	6 8 10 9		SP		Medium dense, dark brov little Silt, dry (SP)	vn fine SAND, some coarse	e to fine Gravel,	-	-	-	-			
	S-3 4.0'- 6.0'	18	10 15 18 21		SP Dense, brown coarse SAND, some coarse Gravel, trace Silt, moist - - - - SP Very dense, dark brown coarse to fine SAND, little fine Gravel, trace - - - -											
-	S-4 6.0'- 8.0'	17	27 32 21 20		SP Very dense, dark brown coarse to fine SAND, little fine Gravel, trace -											
-	S-5 8.0'- 10.0'	17	6 19 15 12		CL	8.0 Hard, brown CLAY, trace fine Sand, little coarse to fine Gravel, moist (CL) - L L PP = 2.									j tsf	
10 	S-6 10.0'- 12.0'	11	8 14 14 23		CL		Very stiff, brown CLAY, tr moist (CL)	ace fine Sand, little coarse	to fine Gravel,	-	-	L	L	PP = 0.75	j tsf	
- 	S-7 15.0'- 17.0'	12	5 55 50 11		CL		Hard, brown CLAY, some	fine Gravel, trace fine San	d, moist (CL)	-	-	L	L	PP = 0.5	tsf	
-						17.0) End of Boring at 17 feet E Borehole backfilled with s	GS. soil cuttings and restored w	ith asphalt patch.							
		Water Le	evel Data	whin for	+ +a-		Sample Type	Notes:								
Date	Time	itapsed Time	Dep Bot. of	Bottom		-0-	Open End Rod	Groundwater not en	countered during	drilli	ng a	ctiv	ties.			
		(hr)	Casing	of Hole	water	1.	I hin-Wall Tube									
						10	Undisturbed Sample									
						- - - - - -	Grab Sample									
						\dashv	Side Sample							Boring N	o.: B-19	
Field Te	st Legend	d: Dila Tou	itancy: ighness:	N - No L - Lo	one S- w M-N	Slow /lediu	R - Rapid I m H - High I	Plasticity: NP - No Dry Strength: N - Nor	on-Plastic L - Lov ne L - Low M - N	v M Nediu	I - M Im	ediu H -	ım High	H - High 1 VH - V	ery High	
NOTES:	1.) "ppd" d 3.) Maximu	<u>enotes soil</u> ım Particle	sample av Size is de	<u>erage diar</u> termined b	netral poo y direct o	cket pe bserva	enetrometer reading. 2.) ation within limitations of sa	<u>"ppa" denotes soil sample</u> ampler size. 4.) Soil iden	average axial pocket tifications and field te	t pene ests b	etron ase	<u>neter</u> d on	read visua	ling. Il-manual I	nethods per ASTM D2488.	

MOT	T DONAL	м	м					SOI	L BORING LO	G						BORING NO.: B-20 Page 1 of 1
Projec	t:	West S	oringfield-	Sewer E	xpansio	n Proj	ect			Project No.:		5	5074	1086	36-002	
Locatio	on:	West S	oringfield,	Massac	nussets					Project Mgr:		_ <u>E</u>	<u>Eric</u>	Pau	li	
Drilling	1 Co.:	New En	aland Bor	ina	leia					Date/Time Star	: ted:		June	<u>y ∟y</u> ∋ 24.	<u>es</u> 2019 at	11:42 am
Driller/	Helper:	Scott M	arino /Em	il Chobot						Date/Time Finis	shed:		June	e 24	2019 at	1:36 pm
Elevation	1: Grade ft	. Vert	ical Datum	:		Boring	g Location	: Intersection of	of Sweetfern Drive and Herr	nlock Hill Road	Coo	rd.:	La	t: 42.	13994 Lo	ng: -72.649585
Item Type		Casing	Samp	oler Cor	e Barrel	Ria M	ake & Mod	el: Mobile B.	53	Hammer Type	Hori	zont	al D	atum	Drill Ro	83 d Size:
Length		5 ft	2 f	t	-	Tru	ck [Cat-Head	□ Safety	□в	ento	nite			Casing Advance
Inside Di Hammer	a. (in.) Wt. (lb.)	3.25	1.37)	-	⊔ AT □ Tra	V L ck D	☐ Geoprobe] Air Track	✓ Winch ✓ Roller Bit	☐ Doughnut		olym ∕ater	er			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	🗌 Ski	d []	Cutting Head		M N	one				
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo		V co optior	/isual - Manu (Density/cor onstituents, p nal descriptio	ual Identification & Des hsistency, color, Group barticle size, structure, r ons, geologic interpretat	cription Name, noisture, ion, Symbol)	Dilatancy	Loughness	Plasticity 59 L	Dry Strength		Remarks
-	S-1 0.0'- 2.0' S-2	15 24	14 10 10 8 12		SP	0.2 \	Top (2") - / Medium de Medium de	ASPHALT ense, brown fii ense, brown fii	ne SAND, little Silt, dry (SP ne SAND, little Silt, dry (SP)	-	-	-	-	Top 2" As	sphalt
-	2.0'- 4.0' S-3	16	14 20 14 14			Medium dense, light brown fine SAND, dry (SP)										
- 5	4.0'- 6.0' S-4	24	13 16 19 18		SP		Dense, lig									
-	6.0'- 8.0' S-5	17	18 18 26		SM	SP Dense, light brown fine SAND, dry (SP) - <td></td>										
- 10	8.0'- 10.0'		27 25 26			10.0	dry (SM)		e to fine OAND, some ont,	some line Gravel,						
-	S-6 10.0'- 12.0'	15	20 17 20 21		SP	10.0 - - - - Dense, light brown coarse to fine SAND, some fine Gravel, dry (SP) - - -										
 15 	S-7 15.0'- 17.0'	15	8 12 15 19		SP	Medium dense, light brown coarse to fine SAND, dry (SP)										
-					17.0 End of Boring at 17 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.											
		Water Le	evel Data	atha ! f:	440-		Samp	е Туре	Notes:							
Date	Time	Elapsed Time	Dep Bot. of	oth in fee Bottom	t to:	-0	Open Er	nd Rod	Groundwater not er	ncountered during	drillir	ng a	ctivi	ties.		
		(hr)	Casing	of Hole	Water	1.	Thin-Wa	all Tube								
						1	Undistui	rbea Sample								
						100	Grah Sa	ample								
						- °		pic							Boring N	o.: B-20
Field Te	st Legend	l: Dila	tancy:	N - N	one S-	Slow	R - Rapi	id	Plasticity: NP - N	on-Plastic L - Lo	w M	- Me	ediu	Im	H - High	
NOTES	4 \ !! !!! .	Tou	ghness:	L - Lo	W M-N	/lediur	n H-Hig	gh	Dry Strength: N - No	ne L-Low M-I	Vediu	m	H -	High	VH - V	ery High
NUTES:	3.) Maximu	im Particle	Size is de	termined b	y direct o	bservat	tion within	limitations of s	ampler size. 4.) Soil ider	average axial pocket ntifications and field t	tests b	ased	on	read visua	ing. I-manual i	methods per ASTM D2488.

MOT	T DONAL	м	м					SOI	L BORING LO	G						BORING NO.: B-21
Projec	t:	West S	pringfield	- Sewer E	Expansio	n Proj	ect			Project No.:		_	507	408	636-002	Fage TOTT
Locati	on:	West S	pringfield	Massac	hussets					Project Mgr:		_	Eric	Pa	uli	
Client:	0	Townsh	nip of Wes	st Springf	ield					Field Eng. Staff	f:	-	Cod	y Ly	/nes	2:00 mm
Driller	g Co.: /Helner:	Scott M	arino /Em	ning nil Chobo	ł					Date/Time Star	tea: shed [.]		Jun Jun	e 24 e 24	<u>+, 2019 at</u> 4. 2019 at	2:00 pm
Elevatio	n: Grade ft	Vert	ical Datun	1:		Boring	Location	: In front of 141	Sweetfern Drive	Butorrinorrino	Cod	ord.:	La	t: 42	2.141088 L	.ong: -72.649874
Item		Casing	Sam	oler Cor	e Barrel	Dia	-		20		Hor	izon	tal D)atu	m: NAD 19	83 d Since
Length		5 ft	2 f	t i	-		ck [Tripod	Cat-Head	□ Safety		Bento	g rii onite	מוג	Drill RC	Casing Advance
Inside Di	ia. (in.)	3.25	1.3	75	-			Geoprobe	Winch	Doughnut		Polyr	ner			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-		d D		Cutting Head			None	-			
Denth/	Sample		Comple				v	/isual - Manu	al Identification & Des	cription	F	-ielc	l Te	sts	1	
Elev.	No. /	Rec.	Blows	Stratum	Group			(Density/cor	sistency, color, Group I	Name,	2	less	₽	ength		Remarks
(ft)	(ft)	(11)	per 6"		' Symbo		option	nal descriptio	ns, geologic interpretati	ion, Symbol)	ilatan	udpino	lastic	Iry Sti		
	S-1	18	10	•••••	. 00	0.2	Top (2")	ASPHALT				· -	-	-	PID = 0.0	PPM
	0.0'- 2.0'		11		SP		Medium d	ense, brown m	edium to fine SAND, trace	Silt, dry (SP)						
F			10 7													
			,													
-	S-2	19	7		SP		Medium d	ense, brown m	edium to fine SAND, some	fine Gravel, dry	-		-	-	PID = 0.0	PPM
	2.0'- 4.0'		8	· · · · · ·			(SP)									
F			7													
						4.0										
F	S-3	3	9	býĊ	GP		Dense, bro	own coarse to t	fine GRAVEL, some coarse	e to fine Sand, dry	-	-	-	-	PID = 0.0	PPM
	4.0'- 6.0'		15	60°C	-		(GP)									
			18	60	1											
					8											
-	S-4	6	12	$\sum_{i=1}^{n}$	GP		Medium d	ense, brown co	parse to fine GRAVEL, som	ne coarse to fine	-	-	-	-	Terracore	environmental sampled
	6.0'- 8.0'		12	00	N.		Sand, dry	(GP)							PID = 0.0) PPM
F			13	$[\circ \land \circ]$												
				Poo	4	8.0										
–	S-5	15	6		SP		Medium d	ense, brown co	parse to medium SAND, littl	le fine Gravel, dry	-	-	-	-	Composi	te environmental sampled
	8.0'- 10.0'		7		÷		(01)								PID = 0.0	PPM
Γ			8		:											
					·											
10	S-6	24	9		SP		Medium d	ense, brown co	parse to fine SAND, little fin	ne Gravel, dry (SP)	-	-	-	-		
L	10.0'- 12 0'		5		·											
	12.0		8		.]											
L					·											
					÷											
L																
					:]											
_					·											
					.]											
15	0.7															
	5-7	24	5 6		- SP		weaium d	ense, brown m	eaium to tine SAND, dry (S	pr)	-	-	-	-		
╞	15.0'- 17.0'		5	·····	·											
			5		.]											
╞				<u> </u>	·	17.0	End of Pa	ring at 17 fact !	365							
							Borehole I	backfilled with	soil cuttings and restored w	vith asphalt patch.						
╞																
╞																
	L	Water Le	evel Data	L			Samp	le Type	Notes:						L	
Data	Time	Elapsed	De Bot of	oth in fee	et to:	0	Open E	nd Rod	Groundwater not er	ncountered during	drilli	ng a	ctiv	ities	i.	
Date	Time	(hr)	Bot. of Casing	of Hole	Water	т	Thin-Wa	all Tube								
						U	Undistu	rbed Sample								
						SS	Split Sp	oon Sample								
						- 6	GIAD SS	ampie							Boring N	o.: B-21
Field Te	st Legend	d: <u>D</u> ila	atancy:	N - N	one S-	Slow	R - Rap	id	Plasticity: NP - No	on-Plastic L - Lo	w N	1 - N	lediu	ım	H - High	
NOTEO	1)"		ighness:	L - Lo	w M-N	/lediun	n H-Hig	gh reading 0.	Ury Strength: N - Nor	ne L-Low M-I	Mediu	um	H -	Hig	n VH-V	ery High
NUTES:	3.) Maximu	im Particle	sample av Size is de	termined b	by direct of	bservat	ion within	limitations of s	ampler size. 4.) Soil iden	tifications and field f	tests l	base	d on	visu	al-manual	methods per ASTM D2488.

MOT		м	м					SOI	L BORING LC)G						BORING NO.: B-22
Projec	t:	West S	prinafield-	- Sewer I	Expansio	n Proi	iect			Proiect No.:			507	4086	36-002	Page 1 of 2
Locati	on:	West S	pringfield,	Massac	hussets					Project Mgr:		_	Eric	Pau	li	
Client:	-	Townsh	ip of Wes	st Spring	ield					Field Eng. Staff	:		Cod	y Ly	nes	
Drilling	j Co.: 'Helper'	New En	gland Bor arino /Em	il Chobo	ł					Date/Time Starl	ed:	-	July	<u>, 10,</u> 10	2019 at 1 2019 at 1	1:10 am
Elevation	1: Grade ft	. Vert	ical Datum	n:		Borin	a Locatior	1: In front of 33	Sweetfern Drive	Daterrinerning	Coc	rd.:	La	t: 42	1382922	Long: -72.6492298
Item		Casing	Samp	oler Cor	e Barrel	Dia			2	Lieuween Trans	Hor	izon	tal D	atun	1: NAD 19	83 d Sin er
Length		5 ft	2 f	t	-	Tru	ick [Tripod	Cat-Head	Safety		Bento	onite	JIC	Drill RO	Casing Advance
Inside Di Hammer	a. (in.) Wt (lb.)	3.25 140	1.37	75 D	-		V [Geoprobe	Winch			Polyn Voto	ner r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-		id [Cutting Head			lone				
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	i D	۲ c optio	/isual - Manu (Density/cor onstituents, p nal descriptio	al Identification & Des sistency, color, Group article size, structure, r ns, geologic interpretat	scription Name, moisture, tion, Symbol)	ilatancv H	ield ondhness	lasticity	IN Strength		Remarks
_	S-1 0.0'- 2.0'	15	17 19 18 10		\$ SW \$	2.0	Top (2") - Dense, br (SW)	ASPHALT own coarse to t	ine SAND, some coarse to	o fine Gravel, dry	-	-	-	-		
-	S-2 2.0'- 4.0'	12	6 5 5 8		SP		Medium d Gravel, dr	lense, brown co y (SP)	parse to fine SAND, little co	parse to fine	-	-	-	-		
	S-3 4.0'- 6.0'	12	12 7 7 7		SP	6.0	Medium d Gravel, dr	lense, brown co y (SP)	parse to fine SAND, some o	coarse to fine	-	-	-	-		
-	S-4 6.0'- 8.0'	14	7 9 7 7) GP		Medium d Sand, dry	lense, light gray (GP)	v coarse to fine GRAVEL, s	some coarse	-	-	-	-		
-	S-5 8.0'- 10.0'	15	8 12 12 11		GP		Medium d Sand, dry	lense, light brov (GP)	vn coarse to fine GRAVEL	, some coarse	-	-	-	-		
10 	S-6 10.0'- 12.0'	16	14 14 16 19) GP		Dense, lig (GP)	ght gray coarse	to fine GRAVEL, some coa	arse Sand, dry	-	-	-	-		
- 	S-7 15.0'- 17.0'	16	6 12 14 14		SP	. <u>13.5</u>	Medium d	ense, light brov	vn medium to fine SAND, f	trace Silt, dry (SP)		-	-	-		
-					· • • • • • • • • •											
		Water Le	evel Data	oth in for	at to:	-	Samp	le Type	Notes:	populatored during	deille			itic-		
Date	Time	iapsed Time	Bot. of	Bottom	Note:		Open E	nd Rod	Groundwater not er	ncountered during	drilli	ng a	ctiv	ities.		
		(hr)	Casing	of Hole	vvater		I NIN-W	all I UDE								
						lss	Split Sn	ioon Sample								
						G	Grab Sa	ample								
								•							Boring N	o.: B-22
Field Te	st Legen	d: Dila	itancy:	N - N	one S- w M₋™	Slow	R-Rap т н ₋ ⊔:	oid ab	Plasticity: NP - N	lon-Plastic L - Lo	w M	-M	ediu H -	ım Hiat	H - High	ery High
NOTES	1.) "baa" (.1	enotes soil	sample av	/erade dia	metral po	cket pe	netromete	ייפ r reading. 2)	"ppa" denotes soil sample	e average axial pocke	t pene	etron	neter	read	ing.	
	3.) Maximu	um Particle	Size is de	termined l	by direct o	bserva	tion within	limitations of s	ampler size. 4.) Soil ider	ntifications and field t	ests b	ase	d on	visua	l-manual ı	methods per ASTM D2488.

MOT MAC	T DONAL	D M	м			SOIL BORING LOG (continued)						BORING NO.: B-22 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity So L	Dry Strength		Remarks
-	S-8 20.0'- 22.0'	18	15 16 19 19		SP	Dense, brown coarse to fine SAND, little coarse to fine Gravel, dry (SP)	-	-	-	-		
- 25	S-9 25.0'- 27.0'	21	9 12 12 16		SP	Medium dense, brown coarse to fine SAND, moist (SP)	-	-	-	-		
30 	S-10 30.0'- 32.0'	18	12 55 50/3		SP	Very dense, brown coarse to fine SAND, little coarse to fine Gravel, moist (SP)	-	-	-	-		
-						End of Boring at 32 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.						
— 35 -												
- 40												
-												
45												
-									 			
							50 7	74()86	636	-002	B-22
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian termined b	netral pock y direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket ervation within limitations of sampler size. 4.) Soil identifications and field to the same servation within limitations of sampler size.	et pene ests b	trom asec	leter	reac visua	ding. al-manual	methods per ASTM D2488.

MOT	T DONAL	м	м					SOI	L BORING LO	G						BORING NO.: B-23 Page 1 of 2
Projec	t:	West S	oringfield-	Sewer I	Expansio	n Pro	ject			Project No.:		5	5074	1086	36-002	
Locati	on:	West S	oringfield,	Massac	hussets					Project Mgr:		_ <u>E</u>	Eric	Pau	li	
Drilling	a Co.:	New En	aland Bor	ina	liela					Date/Time Star	: ted:		June	y ∟yr ∋ 26.	<u>nes</u> . 2019 at	1:00 pm
Driller	/Helper:	Scott M	arino /Em	il Chobo	t					Date/Time Finis	shed:		June	e 26,	, 2019 at	3:10 pm
Elevatio	n: Grade ft	Vert	ical Datum	n:		Borin	g Location	: Intersection o	f Sweetfern Drive and Woo	odbrook Terrace	Coo	rd.:	La	t: 42.	136841 L	ong: -72.649255
Item Type		Casing HSA	Samp SS	oler Cor	e Barrel	Ria N	lake & Moo	lel: Mobile B-5	53	Hammer Type	Hori	zont	tal D a Flu	atum iid	n: NAD 19	83 d Size:
Length		5 ft	2 f	t 👘	-	Tn	uck [Tripod	Cat-Head	□ Safety	В	ento	nite			Casing Advance
Hammer	Wt. (lb.)	3.25	1.37)	-	∟ AI □ Tra	v L ack D	☐ Geoprobe ☐ Air Track	Roller Bit	Automatic		olym /ater	ner r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	□ Sk	id []	Cutting Head		N N	one	T	4- 1		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo	I	v co optior	/isual - Manu (Density/con onstituents, p nal descriptio	al Identification & Des isistency, color, Group I article size, structure, n ins, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
_	S-1 0.0'- 2.0'	17	9 11 19 33	• •	\$SW	0.3	Top (3") - Dense, bro (SW)	ASPHALT own coarse to f	fine SAND, some coarse to	fine Gravel, dry	-	-	-	-		
-	S-2 2.0'- 4.0'	23	28 24 25 30		• SW • •		Dense, bro	own coarse to f	fine SAND, some fine Grave	el, dry (SW)	-	-	-	-		
	S-3 4.0'- 6.0'	11	26 31 20 18		• SW											
-	S-4 6.0'- 8.0'	29	15 29 40 27		6.0 6.0 ML Hard, brown SILT, little fine Gravel, moist (ML) 8.0 8.0											tsf
-	S-5 8.0'- 10.0'	12	14 17 9 11		8.0 - - - - GP Medium dense, brown coarse to fine GRAVEL, some coarse Sand, dry (GP) - - 10.0 - - -											
10 	S-6 10.0'- 12.0'	15	13 23 32 18		SW	10.0	Very dens dry (SW)	e, brown coars	e to fine SAND, some coar	se to fine Gravel,	-	-	-	-		
- 	S-7 15.0'- 17.0'	10	10 15 19 25		• • • • • • • •		Dense, bro	own coarse to f	ine SAND, some fine Grave	el, dry (SW)	-	-	-	-		
-					• • • • • • • • • • • • • • • • • • • •											
		Water Le Elapsed	evel Data	oth in fee	et to:	<u> </u>	Onen E	nd Rod	Notes: Groundwater not er	ncountered during	drillir	ום או	ctivi	ties		
Date	Time	Time	Bot. of	Bottom	Water	17	Thin-W	all Tube		issumered during	GUIII	.y a	Javi			
		(hr)	Casing	of Hole		Ηů.	Undistu	rbed Sample								
						ss	Split Sp	oon Sample								
						G	Grab Sa	ample .								
															Boring N	o.: B-23
Field Te	st Legend	d: Dila	tancy:	N - N	one S- w M-N	Slow	R-Rap m H-Hi	id ah	Plasticity: NP - No Dry Strength: N - Nor	on-Plastic L - Lo	w M Mediu	- Me m	ediu H -	m Hiah	H - High	ery High
NOTES:	1.) "ppd" de	enotes soil	sample av	erage dia	metral poc	ket pe	enetrometer	reading. 2.)	"ppa" denotes soil sample	average axial pocke	et pene	trom	neter	read	ing.	
	3.) Maximu	m Particle	Size is de	termined I	by direct of	oserva	tion within	limitations of sa	ampler size. 4.) Soil iden	tifications and field t	ests b	ased	lon	visua	I-manual I	methods per ASTM D2488.

MOT MAC	T DONAL	D M	м			SOIL BORING LOG						BORING NO B-23 Page 2 of 2	D.: 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness pie	Plasticity	Dry Strength		Remarks	
-	S-8 20.0'- 22.0'	17	10 13 14 13		SW	Medium dense, brown coarse to fine SAND, some coarse to fine Gravel, dry (SW)	-	-	-	-			
- 25 - -	S-9 25.0'- 27.0'	18	18 21 22 22		SW	Dense, brown coarse to fine SAND, trace fine Gravel, dry (SW)	-	-	-	-			
30 	S-10 30.0'- 32.0'	16	10 16 18 18		SW	Dense, brown coarse to fine SAND, dry (SW)	-	-	-	-			
35 	S-11 35.0'- 37.0'	19	12 15 20 21		SW	Dense, brown coarse to fine SAND, moist (SW) 37.0 End of Boring at 37 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	-	-	-	-			
40 													
- 													
		·	·	·			PRC 507	JE0 740	ст і 170 186	NO. 636	5-002	BORING NO.: B-23	
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian	netral pock v direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket ervation within limitations of sampler size. 4.) Soil identifications and field te	pene sts b	trom ased	eter on	rea visu	ding. al-manual	methods per ASTM [02488.

Project Mail Spatial Control Scene Density Project N: Density Differentiation Project N: Density Differentiation Differentiation Transming of West Strandful Assess Control of Assesse Control Of Assess Control Of Assess Control Of Assess Control Of	MOT		м	м					SO	L BORING I	_0	G						BORING NO.: B-24
Delar Grave Delar Grave <thdelar grave<="" th=""> <thdelar grave<="" th=""></thdelar></thdelar>	Project Locatio Client:	t: on:	West S West S Townsh	pringfield pringfield, ip of Wes	- Sewer , Massac st Spring	Expansio hussets field	n Proj	ect				Project No.: Project Mgr: Field Eng. Sta	ff:	-	507 Eric Coc	408 2 Pa	636-002 uli /nes	Page 1 of 1
Districtinger: South Munice Amile Checker Data of the Problem: Data of t	Drilling	g Co.:	New En	gland Bo	ring							Date/Time Sta	rted:	-	Jun	e 2	5, 2019 at	8:15 am
Image Total Total <th< td=""><td>Driller/</td><td>Helper:</td><td>Scott M</td><td>arino /Em</td><td>il Chobo</td><td>ot</td><td></td><td></td><td></td><td></td><td></td><td>Date/Time Fin</td><td>ished:</td><td>and a</td><td>Jun</td><td>e 2</td><td>5, 2019 at</td><td>9:07 am</td></th<>	Driller/	Helper:	Scott M	arino /Em	il Chobo	ot						Date/Time Fin	ished:	and a	Jun	e 2	5, 2019 at	9:07 am
Type 165 52	Item	. Glade It	Casing	Sam	n. Dier Co	re Barrel	Borin	g Locatior	1: In front of 26	5 WOODDOOK Terrace			Hor	izor	ntal E	Datu	n: NAD 19	83
Model Homerov (I) Constraint (I) Cons	Туре		HSA	SS	}	-	Rig M	lake & Moo	lel: Mobile B-	53		Hammer Type	D	rillir	ng Fl	uid	Drill Ro	d Size:
Hummer Halls Los Hall Inst. Inst. <thinst.< th=""> Inst. <thinst.< th=""> <</thinst.<></thinst.<>	Length Inside Di	a. (in.)	5π 3.25	1.37	t 75	-	M Iru	ick L V [Geoprobe	☐ Cat-Head ✓ Winch		Safety Doughnut		3ent Polv	onite mer			Casing Advance
Hermiterial BJ O O Display Hermiterial Control Display Display <thdisplay< th=""> Display Display</thdisplay<>	Hammer	Wt. (lb.)	140	140	0	-		ack [Air Track	Roller Bit		Automatic		Vate	er			Hollow Stem Auger
Degrad (n) Simple (n) React (n) Simple (n) Simple (n) Vision (n) Vision (n) Wision (n) Vision (n) Non- transform Non- transfo	Hammer	Fall (In.)	30	30		-		id L		Cutting Head				iel) 1 Te	sts		
8.1 13 16 0.7 0.7 10 0.7 0.7 10 0.7	Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratun Graphie	Group Symbo))	د option	/isual - Man (Density/co onstituents, nal description	ual Identification & nsistency, color, Gro particle size, structur ons, geologic interpr	Des oup I re, n etati	cription Name, noisture, ion, Symbol)	Dilatancv	Tolinhness	Plasticity	Dry Strength		Remarks
5.3 16 34 18 34 92 Very deces, dark brown coarse to fine SAND, little coarse to fine -	-	S-1 0.0'- 2.0' 0.2'-'	13	16 50 23 16		GW	0.2 2.0	<u>Top (2") -</u> Very dens dry (GW)	ASPHALT e, dark brown	coarse to fine GRAVEL	., SOI	me coarse Sand,			-	-	Likely sul	obase material.
S-3 19 12 SP Medium dense, brown coarse to fine SAND, tille fine Gravel, dry (SP) -	-	S-2 2.0'- 4.0'	18	24 31 22 16		SP		Very dens Gravel, dr	e, dark brown y (SP)	coarse to fine SAND, li	ttle c	coarse to fine	-	-	-	-		
S-4 20 7 SP Medium dense, brown coarse to fine SAND, dry (SP) -	5	S-3 4.0'- 6.0'	19	12 8 6 4		SP		Medium d	ense, brown c	coarse to fine SAND, litt	le fin	ne Gravel, dry (SP)	-	-	-	-		
S-5 13 3 SP Very loose, brown coarse to fine SAND, little Silt, dry (SP) - </td <td>-</td> <td>S-4 6.0'- 8.0'</td> <td>20</td> <td>7 8 6 5</td> <td></td> <td>SP</td> <td></td> <td>Medium d</td> <td>ense, brown c</td> <td>coarse to fine SAND, dry</td> <td>/ (SF</td> <td>)</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td></td> <td></td>	-	S-4 6.0'- 8.0'	20	7 8 6 5		SP		Medium d	ense, brown c	coarse to fine SAND, dry	/ (SF)	-	-	-	-		
10 S-8 18 19 GW Dense, dark brown coarse to fine GRAVEL, some coarse to fine -	-	S-5 8.0'- 10.0'	13	3 2 1 5		SP	10.0	Very loose	e, brown coars	e to fine SAND, little Si	lt, dr	y (SP)	-	-	-	-		
-15 S-7 12 14 Dense, dark brown coarse to fine GRAVEL, some coarse to fine -15 S-7 12 14 Dense, dark brown coarse to fine GRAVEL, some coarse to fine -17.0 24 18 17.0 17.0 -17.0 18 17.0 17.0 -17.0 24 18 17.0 -17.0 18 17.0 17.0 -17.0 18 17.0 17.0 -17.0 18 17.0 17.0 -17.0 18 0 0 -17.0 Depth in feet to: 0 Open End Rod -17.0 Easing of Hole 0 Open End Rod Groundwater not encountered during drilling activities. -18 Image: Split Spoon Sample Split Spoon Sample Grad Sample Boring No:: B-24 Field Test Legend: Dilatancy: N - None S - Slow M - R-Rapid Plasticity: NP - Non-Plastic L - Low M - Medium H - High -1.0 -1.0 M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High -1.0 -1.0 M - Medium H - High Dry Strength: N - None L - Lo	-	S-6 10.0'- 12.0'	18	19 16 17 19		GW		Dense, da Sand, dry	rk brown coar (GW)	se to fine GRAVEL, sor	ne c	oarse to fine	-	-	-	-		
Water Level Data Sample Type Notes: Date Time Time Boring hold Boring hold Groundwater not encountered during drilling activities. Date Time Time Boring hold Groundwater not encountered during drilling activities. Image: Signal of Hole Water Level Data O Open End Rod Groundwater not encountered during drilling activities. Image: Signal of Hole Water T Thin-Wall Tube U Undisturbed Sample Groundwater not encountered during drilling activities. Field Test Legend: Dilatancy: N - None S - Slow R - Rapid Plasticity: NP - Non-Plastic L - Low M - Medium H - High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sample average axial pocket penetrometer reading. 2.) "ppa" denotes soil sample average diametral pocket penetrometer reading. Avainum Particle Size is determined by direct observation within limitations of sample average axial pocket penetrometer reading. 2.) "ppa" denotes soil sample average average average avail pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of		S-7 15.0'- 17.0'	12	14 20 24 18		GW	17.0	Dense, da Sand, mo	irk brown coar ist (GW)	se to fine GRAVEL, sor	ne c	coarse to fine	-	-	-	-		
Water Level Data Sample Type Notes: Date Time Elapsed Depth in feet to: (hr) O Open End Rod T Groundwater not encountered during drilling activities. T Time Bot. of (hr) Bot. of Casing Bottom of Hole Water T Thin-Wall Tube U Undisturbed Sample U Undisturbed Sample Boring No.: B-24 Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid Dry Strength: Plasticity: N - None NP - Non-Plastic L - Low M - Medium H - High Dry Strength: N - None L - Low M - Wery High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.	-							End of Bo Borehole	ring at 17 feet backfilled with	BGS. soil cuttings and restor	ed w	vith asphalt patch.						
Date Time Field Test Legend: Depth in reet to: O Open End Rod T Thin-Wall Tube Groundwater not encountered during drilling activities. Image: Stress of the stress of t			Water Le	evel Data	oth in f	at to:		Samp	le Type	Notes:								
(hr) Casing of Hole Water V T Thin-Wall Tube U U Undisturbed Sample S Split Spoon Sample G Grab Sample Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low M - Medium H - High Plasticity: Dry Strength: NP - Non-Plastic L - Low M - Medium H - High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.	Date	Time	itapsed Time	Der Bot. of	Bottom		0	Open E	nd Rod	Groundwater no	ot er	ncountered during	g drilli	ng a	activ	ities		
Image: Construct of the second state of the second stat			(hr)	Casing	of Hole	Water	1.	Thin-W	all Tube									
Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low M - Medium H - High Plasticity: Dry Strength: NP - Non-Plastic L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Boring No.: B-24 NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.								Undistu	rbea Sample	*								
Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low M - Medium H - High Plasticity: Dry Strength: N P - Non-Plastic L - Low M - Medium H - High Boring No.: B-24 NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.							100	Grah Q	oon oampie ample									
Field Test Legend: Dilatancy: N - None S - Slow R - Rapid Plasticity: NP - Non-Plastic L - Low M - Medium H - High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.							۲Ľ		anihie.								Boring N	o.: B-24
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High VH - Very High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.	Field Te	st Legen	d: Dila	itancy:	N - N	lone S-	Slow	R - Rap	id	Plasticity: NP	- N	on-Plastic L - L	ow N	1 - N	/ledi	um	H - High	
NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 3.) Maximum Particle Size is determined by direct observation within limitations of sampler size. 4.) Soil identifications and field tests based on visual-manual methods per ASTM D2488.	ļ	-	Tou	ighness:	L - L	ow M-N	Nediur	m H-Hi	gh	Dry Strength: N -	Nor	ne L-Low M-	Mediu	ım	Η-	Hig	h VH-V	ery High
	NOTES:	<u>1.) "ppd" d</u> 3.) Maximι	enotes soil ım Particle	sample av Size is de	verage dia termined	metral poo by direct o	<u>cket pe</u> bserva	netromete tion within	reading. 2. limitations of s	.) "ppa" denotes soil sar sampler size. 4.) Soil	nple iden	average axial pock ntifications and field	et pen tests t	etro base	nete d on	r rea visu	ding. al-manual i	methods per ASTM D2488.

MOT	T DONAL	м	м				SOI	L BORING LO	G						BORING NO.: B-25
Project	t:	West S	oringfield	- Sewer	Expansic	on Proje	ect		Project No.:			5074	1086	36-002	
Locatio	on:	West S	oringfield,	Massac	hussets				Project Mgr:		_	Eric	Pau	lli	
Drilling	Co.:	New En	gland Bo	ring	lieid				Date/Time Start	ed:		June	<u>y ∟y</u> ∋ 25	, 2019 at	9:37 am
Driller/	, Helper:	Scott M	arino /Em	il Chobo	ot				Date/Time Finis	hed:	_	June	e 25	, 2019 at	10:19 am
Elevation	1: Grade ft	. Vert	ical Datum	1: Nor Co	ro Barrol	Boring	g Location: In front of 197	Woodbrook Terrace		Coo	rd.:	La	t: 42.	138055 L	ong: -72.64721
Туре		HSA	Sam		-	Rig Ma	ake & Model: Mobile B-5	3	Hammer Type	Dr	illing	g Flu	id	Drill Ro	d Size:
Length Inside Di	a. (in.)	5 ft 3.25	2 f	t 75	-		ck 🗌 Tripod	Cat-Head	Safety Doughput		ento olvm	nite er			Casing Advance
Hammer	Wt. (lb.)	140	140)	-		ck 🗌 Air Track	Roller Bit	Automatic	ŪV	/ate	-			Hollow Stem Auger
Hammer	raii (in.)		30		-				·	F	<u>one</u> ield	Tes	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratun Graphie	Group Symbo	S D D	Visual - Manu (Density/con constituents, p optional descriptio	al Identification & Des isistency, color, Group I article size, structure, n ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
_	S-1 0.0'- 2.0'	14	10 15 14 13		SP	0.3	Top (3") - ASPHALT Medium dense, brown co (SP)	parse to fine SAND, little co	parse Gravel, dry		-	-	-	PID = 0.0	PPM
-	S-2 2.0'- 4.0'	20	25 23 23		SP		Dense, brown coarse to f	ïne SAND, trace coarse Gr	ravel, dry (SP)	-	-	-	-	PID = 0.0	PPM
	S-3 4.0'- 6.0'	16	25 17 18 21		SP		Dense, brown coarse to f	ine SAND, trace coarse Gr	ravel, dry (SP)	-	-	-	-	PID = 0.0	PPM
-	S-4 6.0'- 8.0'	24	22 21 21 23		SP		Dense, brown coarse to f	îne SAND, dry (SP)		-	-	-	-	PID = 0.0	PPM
-	S-5 8.0'- 10.0'	23	25 13 16 16		SP		Dense, light brown coars	e to fine SAND, dry (SP)		-	-	-	-	PID = 0.0	РРМ
10 	S-6 10.0'- 12.0'	17	17 14 20 16 16		SP		Dense, brown coarse to f	ïne SAND, little coarse Gra	avel, dry (SP)	-	-	-	-		
-						13.5				_					
15	S-7 15.0'- 17.0'	18	10 10 20 23		ML		Very stiff, dark brown SIL (ML)	T, trace fine Sand, little coa	arse Gravel, moist	-	-	-	-		
-						17.0	End of Boring at 17 feet E Borehole backfilled with s	3GS. soil cuttings and restored w	vith asphalt patch.						
		Water I 4	evel Data		1	+	Sample Type	Notes:			<u> </u>	L			
D-1	T '	Elapsed	Dep	oth in fe	et to:	0	Open End Rod	Groundwater not er	ncountered during	drilliı	ng a	ctivi	ties.		
Date	Time	Time (hr)	Bot. of Casing	Bottom	Wate	г	Thin-Wall Tube								
		,	caoing			Jυ	Undisturbed Sample								
						ss	Split Spoon Sample								
					1	G	Grab Sample							Borina N	o.: B-25
Field Te	st Legend	l d: Dila Tou	tancy: ghness:	I N - N L - Lo	I lone S- ow M-I	Slow Vedium	R - Rapid n H - High	Plasticity: NP - No Dry Strength: N - No	on-Plastic L - Lov ne L - Low M - N	v M Nediu	- M m	ediu H -	ım High	H - High NVH - V	ery High
NUTES:	1.) "ppd" de 3.) Maximu	enotes soil im Particle	Size is de	<i>ierage dia</i> termined	unetral po by direct c	<u>скеt per</u> bservati	tion within limitations of sa	ppa [®] denotes soil sample ampler size. 4.) Soil iden	average axial pocket ntifications and field te	ests b	asec	l on	read visua	iing. Il-manual i	methods per ASTM D2488.

MOT		M	м					SOII	BORING LO	G						BORING NO.: B-26
Projec	t:	West S	pringfield-	Sewer	Expansic	n Pro	ject			Project No.:			507	408	636-002	Page 1 of 1
Locatio	on:	West S	oringfield,	Massad	chussets					Project Mgr:		_	Eric	: Pa	uli	
Client:	•	Townsh	ip of Wes	t Spring	field					Field Eng. Staff		-	Coo	ly L	/nes	40:40
Driller	j CO.: 'Helper'	Scott M	giano Bor arino /Em	ing il Chobr	nt					Date/Time Start	ea: hed:	-	Jur Jur	ie 23	5, 2019 at 5, 2019 at	10:40 am
Elevation	1: Grade ft	t. Vert	ical Datum	:	~	Borin	d Location:	: In front of 146	Woodbrook Terrace	Dute, Time Time	Coo	rd.:	Li	at: 42	2.136957 I	_ong: -72.647624
ltem		Casing	Samp	oler Co	re Barrel						Hori	izor	ntal I	Datu	m: NAD 19	983
Type Lenath		HSA 5 ft			-	Rig IV	lake & Mod	el: Mobile B-5	3	Hammer Type	Dr B	illir Ient	ng Fl onite	uid	Drill Ro	od Size: Casing Advance
Inside Di	a. (in.)	3.25	1.37	5	-		V L	Geoprobe	Winch	Doughnut		oly	mer			Hollow Stem Auger
Hammer Hammer	Wt. (Ib.) Fall (in.)	140 30	30)	-		id 🗌	Air Track	M Roller Bit ☐ Cutting Head	Automatic	L V M N	Vate Ione	er e			5
	Sample						v	ieual - Manu	al Identification & Des	cription	F	iel	d Te	sts		
Depth/ Elev. (ft)	No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratun Graphi	Group Symbo	S D D	cc option	(Density/con onstituents, p al descriptio	sistency, color, Group I article size, structure, n ns, geologic interpretat	Name, noisture, ion, Symbol)	Dilatancy	Tourdhness	Plasticity	Dry Strength		Remarks
					FILL	0.6	Top (1') - A	SPHALT/COB	BLESTONE							
				Q()]	1.0	(5") - Cobb	lestone								
_	S-1	15	9		SP		Dense, bro	wn coarse to f	ine SAND, little fine Gravel	l, dry (SP)	-	-	-	-		
	1.0'- 3.0'		10 20													
			13													
	S-2	18	14		SP SP		Medium de	ense, brown co	earse to fine SAND, trace fi	ne Gravel, dry	-	-	-	-		
_	3.0'- 5.0'		13 11				(0.)									
			10													
-	S-3	15	7		SP		Medium de	ense, brown co	earse to fine SAND, dry (SF	P)	-	-	-	-		
-	5.0'- 7.0'		8													
			8													
-																
	S-4	17	8 5		SP		Medium de	ense, brown co	earse to fine SAND, dry (SF	2)	-	-	-	-		
_	7.0'- 9.0'		7													
			8													
_																
10	<u> </u>	17	6		en en		Modium da	naa brown aa	orea to fina SAND little as	area to fina						
	3-5	17	9				Gravel, dry	(SP)	arse to fine SAND, fittle co		-	1	-			
-	12.0'		10													
			9													
-																
-																
-																
15	S-6	16	14		SP		Dense, gra	y coarse to fin	e SAND, little fine Gravel, t	trace Silt, dry (SP)	-	-	-	.		
	15.0'-		19													
-	17.0'		16 20													
						17.0)									
Γ				_ · · ·			End of Bor	ing at 17 feet E	BGS.	with asphalt natch						
L							2010HOIE D		ישנייישט מויע ובסנטופע א	uopriait paton.						
L																
		Wator				+	Camel		Notos:							
		Elapsed	Dep	oth in fe	et to:	10	Open Er	nd Rod	Groundwater not er	ncountered during	drillir	ng a	activ	vities	j.	
Date	Time	Time (hr)	Bot. of Casing	Botton	Wate	T	Thin-Wa	all Tube		C C		-				
		()	caoing	.		Jυ	Undistur	bed Sample								
						ss	Split Spo	oon Sample								
						G	Grab Sa	mple							Borina N	0.: B-26
Field To	st Lecon	d Dila	tancv:	N - N	lone S-	Slow	R - Rani	d	Plasticity: NP - N	on-Plastic L-Lo	N N	- 1	ledi	um	H - Hinh	D-2V
	er nogeni	Tou	ghness:	L - L	ow M-I	Vediu	m H - Hig	jh	Dry Strength: N - No	ne L-Low M-N	lediu	m	Η-	Hig	h VH - \	/ery High
NOTES:	1.) "ppd" d	enotes soil	sample av	erage dia	ametral po	cket pe	enetrometer	reading. 2.)	"ppa" denotes soil sample	average axial pocke	t pene	etro	nete	r rea	ding.	mothodo per AOTA DO400
	ວ.) waximu	un Particle	ാ∠e is del	ermined	uy direct c	userva	uon within l	minations of sa	ampier size. 4.) Soll iden	nuncations and field to	esis d	ase	u on	VISU	ai-manual	memous per AS IM D2488.

MOT	T DONAL	M	м					SOI	L BORING LC)G						BORING NO.: B-27 Page 1 of 1
Projec	t:	West S	pringfield	- Sewer I	Expansio	n Proje	ect			Project No.:		_5	5074	1086	36-002	
Locati	on:	West S	pringfield,	Massac	hussets					Project Mgr:		E	Eric	Pau	li	
Client:		Townsh	nip of Wes	st Spring	field					Field Eng. Staf		_(Cod	y Lyr	nes	
Drilling	g Co.:	New En	Igland Boi	ring						Date/Time Star	ted:	_	June	<u>e 25,</u>	2019 at	1:45 pm
Driller/	Helper:	Scott M	arino /Em	II Chobo	t 	Derive		- h - ((- C - C	N/	Date/Time Finis	shed:	<u></u>	June	e 25, • 42	2019 at	2:30 pm
Item	I. Glade II	Casing	Sam	n. Dier Con	e Barrel	вогіпд	Location	: In Ironi of 56	WOODDOOK Terrace		Hori	zont	al D	atum	NAD 19	83
Туре		HSA	SS	3	-	Rig Ma	ke & Mod	lel: Mobile B-	53	Hammer Type	Dr	illing	g Flu	id	Drill Ro	d Size:
Length Inside Di	a. (in.)	5π 3.25	1.37	t 75	-	M Truc □ ATV	ж Ц / [Geoprobe	☐ Cat-Head ✓ Winch	Safety Doughnut	ПР	ento olvm	nite ier			Casing Advance
Hammer	Wt. (lb.)	140	140)	-		ж [Air Track	Roller Bit	Automatic		/ater	-			Hollow Stem Auger
Hammer	Fall (In.)	30	30		-			<u> </u>	Cutting Head		<u>IM N</u> F	one ield	Tes	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo		۷ cc optior	lisual - Manu (Density/cor onstituents, p nal descriptio	ual Identification & Des nsistency, color, Group particle size, structure, r pns, geologic interpretat	scription Name, moisture, tion, Symbol)	Dilatancy -	Toughness	Plasticity	Dry Strength		Remarks
	S-1	15	15			0.5	Top (6") - /	ASPHALT			-	-	-	-		
	0.0'- 2.0'		16	° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °	\$ SW	1	Dense, bro	own coarse to	fine SAND, some coarse G	Gravel, dry (SW)						
-			15		•											
					•											
-	S-2	23	18	ۮٙ؞۫؞۫؞	sw		Medium d	ense, brown co	oarse to fine SAND, little co	oarse to fine	-	-	-	-		
	2.0'- 4.0'		14		*	'	Gravel, dry	/(SVV)								
F			14 11		۰ ۰											
					•											
-	S-3	16	10		• sw		Dense, bro	own coarse to	fine SAND, some fine Grav	vel, dry (SW)	-	-	-	-		
	4.0'- 6.0'		21	؞ؘ؞؞؞ <i>ؘ</i>	Ň											
			18		*											
			20		•											
-	S-4	19	20		\$ sw		Dense, bro	own coarse to	fine SAND, some coarse to	o fine Gravel, dry	-	-	-	-		
	6.0'- 8.0'		19		•		(SW)									
-			16 30		•											
			50		ò											
-	S-5	12	35	نې ن	GW	0.0	Very dens	e, reddish brov	wn coarse to fine GRAVEL,	, some coarse	-	-	-	-		
	8.0'- 10.0'		31			1	Sand, dry	(GW)								
-			24 20													
			20													
10	S-6	24	21		GW		Dense, bro	own coarse to	fine GRAVEL, some coars	e Sand, dry (GW)	-	-	-	-		
	10.0'-		19													
-	12.0'		21 17													
			17													
F				.•												
F						125										
					↓ – –	13.5					-					
-				؞ؘ؞؞؞ <i>ؘ</i>	ò											
					•											
15	S-7	13	21		∘ sw		Dense, bro	own coarse to	fine SAND, some coarse to	o fine Gravel, dry	-	-	-	-		
	15.0'-		17		•	1	(SW)									
╞	17.0'		20		•											
			19		•	47.0										
F				• [*] • [*] • [*] •	1	17.0	End of Boi	ring at 17 feet	BGS.		\neg					
						'	Borehole b	backfilled with	soil cuttings and restored v	with asphalt patch.						
F																
F																
		Water Le	evel Data				Samp	е Туре	Notes:			-	-			
Date	Time	Elapsed	Dep Bot of	oth in fee	et to:	-0	Open Er	nd Rod	Groundwater not e	ncountered during	drillir	ng a	ctivi	ties.		
		(hr)	Casing	of Hole	Water	T	Thin-Wa	all Tube								
							Undistu	rbed Sample	•							
							Split Sp	bon Sample								
							GIAD 28	шре						I	Boring N	o.: B-27
Field Te	st Legend	d: Dila	atancy:	N - N	one S-	Slow	R - Rapi	d	Plasticity: NP - N	Ion-Plastic L - Lo	w M	- Me	ediu	m I	H - High	
	4 \ H	Tou	ighness:	L - Lo	w M-N	/ledium	n H-Hig	gh	Dry Strength: N - No	one L-Low M-	Mediu	m	H -	High	VH - V	ery High
NUTES:	 ppd" de 3.) Maximu 	enotes soi um Particle	sample av Size is de	<i>verage dia</i> termined l	oy direct o	bservati	on within	imitations of s	ampler size. 4.) Soil ider	e average axial pocke ntifications and field	ests b	ased	l on	read visua	ing. I-manual i	methods per ASTM D2488.

MOT	T DONAL	M	м					SOI	L BORING LC	G						BORING NO.: B-28
Project	t:	West S	pringfield	- Sewer	Expansio	on Pro	ject			Project No.:			5074	4086	36-002	
Locati	on:	West S	pringfield,	, Massac	hussets					Project Mgr:			Eric	Pau	lli	
Client:		Townsh	ip of Wes	st Spring	field					Field Eng. Staff		_(Cod	y Ly	nes	
Driller/	Helper:	Scott M	arino /Em	il Chobo	t					Date/Time Start	ea: hed:		July	11.	2019 at 2	1:30 am
Elevation	1: Grade ft	Vert	ical Datum	1:		Borir	ng Location:	In front of 144	Valley View Circle	Bato, Fino Fino	Coo	rd.:	La	t: 42	1359651	Long: -72.6484466
Item		Casing	Sam	oler Co	e Barrel	D '			,	T	Hori	zon	al D	atun	1: NAD 19	83
Length		5 ft	S	t I	-	Tr	uck	Tripod	Cat-Head	Safety		ento	nite	lia	Drill Ro	Casing Advance
Inside Di	a. (in.)	3.25	1.37	75	-			Geoprobe	Winch	Doughnut	ПР	olym	ner			Hollow Stem Auger
Hammer	Fall (in.)	30	30)	-		ack 🗆 kid 🗌	AIT TRACK	Cutting Head			/alei one				-
	Sample						V	isual - Manu	al Identification & Des	cription	F	ield	Tes	sts		
Depth/ Elev. (ft)	No. / Interval (ft)	Rec. (in)	Blows per 6"	Stratum Graphic	Group Symbo	s o ol	co option	(Density/cor nstituents, p al descriptio	nsistency, color, Group particle size, structure, r ns, geologic interpretat	Name, noisture, tion, Symbol)	ilatancy	ssaudpho	asticity	ry Strength		Remarks
	S-1	8	24		0144	0.2	_ Top (2") - A	SPHALT				÷	-			
	0.0'- 2.0'		24		GW		Dense, bro	wn coarse to f	fine GRAVEL, some coarse	e to fine Sand, dry	-	-	-	-	Likely su	obase material.
F	0.2'-'		23				(GVV)									
	0.2 -		14	, •												
-	S-2	19	4		SP	2.0	Medium de	nse, brown co	parse to fine SAND, trace fi	ine Gravel, dry		-	-	-		
	2.0'- 4.0'		8				(SP)									
F			8													
			5													
-	S-3	14	7		SP		Dense, bro	wn coarse to t	fine SAND, trace fine Grave	el, dry (SP)	-	-	-	-		
	4.0'- 6.0'		25													
			9 10													
]											
-	S-4	24	15		SP		Dense, bro	wn coarse to t	fine SAND, dry (SP)		-	-	-	-		
	6.0'- 8.0'		18 17													
F			21													
–	S-5	18	9		SP		Dense, bro	wn coarse to t	fine SAND, dry (SP)		-	-	-	-		
L	8.0'- 10.0'		13 28													
Γ			31													
10																
10	S-6	16	22		SP		Dense, bro (SP)	wn coarse to f	fine SAND, trace fine Grave	el, trace Silt, dry	-	-	-	-		
	10.0'-		21 19		<u>.</u>]		(0.)									
	12.0		21													
L																
L																
_																
15	0.7	40	47				Donas hi	up medium f								
	5-/	10	17		SP		Dense, bro	wn meaium to	o nine SanuD, ary (SP)		-	-	-	-		
╞	15.0'- 17.0'		18		:											
			21													
F				[:												
╞					i											
				·····												
╞				·····												
		Water Le	evel Data		•1		Sample	е Туре	Notes:			-	-			
Date	Time	Elapsed	Dep Bot of	bth in fee	et to:	- °	Open En	d Rod	Groundwater not er	ncountered during	drillir	ng a	ctivi	ties.		
		(hr)	Casing	of Hole	Wate	r T	Thin-Wa	II Tube								
						-	Undistur	bed Sample								
					1	100	Grah Spo	on sample mole								
						\dashv		npio							Boring N	o.: B-28
Field Te	st Legen	d: Dila	itancy:	N - N	one S	- Slow	R - Rapio	d .	Plasticity: NP - N	lon-Plastic L - Lov	ν M	- M	ediu	im .	H - High	
NOTES	1) "nnd" -	Tou enotes aci	ighness:	L - Lo	w M-	viediu	m H - Hig	n reading 2.)	Ury Strength: N - No	ne L-Low M-N	/lediu	m	H -	High	NVH-V	ery High
INUIES:	3.) Maximu	um Particle	Size is de	termined	by direct of	bserva	ation within li	mitations of s	ampler size. 4.) Soil ider	ntifications and field to	ests b	asec	lon	visua	il-manual i	methods per ASTM D2488.

MOT MAC	T DONAL	M	м			SOIL BORING LOG						BORING N B-28 Page 2 o	NO.: f 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Toughness pla	Plasticity So L	Dry Strength		Remarks	
-	S-8 20.0'- 22.0'	18	18 28 29 30		SP	Very dense, brown fine SAND, dry (SP) 22.0 End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.	-	-	-	-			
- - 25													
-													
- - 													
-													
- - 35													
-													
- - 													
-													
- - 													
-							PRC	DJEC		NO.:		BORING NO.:	
NOTES:	1.) "ppd" d 3.) Maximu	enotes so ım Particl	il sample av e Size is de	verage dian termined by	netral pock y direct obs	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket servation within limitations of sampler size. 4.) Soil identifications and field te	507 pene sts ba	trom	186	reac	ding.	B-28	D2488.

MOT	T DONAL	м	м				SOIL	BORING LO	G						BORING NO.: B-29 Page 1 of 3
Projec	t:	West S	pringfield-	- Sewer	Expansic	n Pro	iject		Project No.:		_	507	4086	36-002	
Locatio	on:	West S	pringfield,	Massac	<u>hussets</u>				Project Mgr:		-	Eric Cod	Pau		
Drilling	Co.:	New En	gland Bor	ring					Date/Time Start	ed:	-	Jun	<u>у ∟у</u> е 26,	, 2019 at	8:10 am
Driller/	Helper:	Scott M	arino /Em	il Chobo	ot				Date/Time Finis	hed:		Jun	e 26	, 2019 at	12:04 pm
Elevation	1: Grade ft	Vert	ical Datum	1: -lan Ca		Borin	ng Location: In front of 194	Valley View Circle		Coc	rd.:	La	t: 42.	13465 Lo	ng: -72.649213
Type		HW	Samp	Sier Co	-	Rig M	Make & Model: Mobile B-53	3	Hammer Type	Hor	illin	g Flu	uid	Drill Ro	83 d Size:
Length	a (in)	5 ft	2 f	t 75	-	Tr.	uck	Cat-Head	Safety		ento	onite			Casing Advance
Hammer	a. (iii.) Wt. (lb.)	140	1.57	5	-		ack 🗌 Air Track	Roller Bit	Automatic		Vate	r			Mud Rotary
Hammer	Fall (in.)	30	30		-	□ Sk	kid 🗌	Cutting Head			lone	То	ote		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratun Graphi	USCS Group Symbo	i D Dl	Visual - Manua (Density/cons constituents, pa optional description	al Identification & Deso sistency, color, Group N article size, structure, m ns, geologic interpretati	c ription Name, noisture, on, Symbol)	Dilatancv	Toughness	Plasticity	Dry Strength		Remarks
_	S-1 0.0'- 2.0'	13	15 16 14 13		\$ \$ \$	0.2	<u>∖Top (2")</u> - ASPHALT Dense, brown coarse to fi	ne SAND, trace fine Grave	I, dry (SW)	-	-	-	-		
-	S-2 2.0'- 4.0'	23	11 13 13		SW		Medium dense, brown coa (SW)	arse to fine SAND, little find	e Gravel, dry	-	-	-	-		
- 5	S-3 4.0'- 6.0'	18	15 11 19 23		SW		Dense, brown coarse to fi (SW)	ne SAND, little coarse to fi	ne Gravel, dry	-	-	-	-		
-	S-4	18	25 22 17		¢ SW		Dense, brown coarse to fi	ne SAND, dry (SW)		-	-	-	-		
-	S-5	20	19 23 13		s SC	8.0	Dense, brown fine SAND,	some Clay, dry (SC)			-	-	-		
- 10	8.0'- 10.0'		16 14 9			10.0)								
-	S-6 10.0'- 12.0'	20	9 10 11 15		CL		Very stiff, brown CLAY, so	ome coarse Sand, little Silt	, dry (CL)	-	-	-	-	PID = 1.5	tsf
-						13.5	5			_					
15 	S-7 15.0'- 17.0'	10	11 14 18 18		SP		Dense, brown fine SAND,	dry (SP)		-	-	-	-		
-															
		Water Lo	evel Data	ath in f			Sample Type	Notes:							
Date	Time	Liapsed Time	Dep Bot. of	Bottom			Open End Rod	Groundwater not en	countered during	drilli	ng a	ctiv	ties.		
		(hr)	Casing	of Hole	water	1.	I hin-Wall Tube								
						-	Solit Spoon Sample								
						- - - -	Grab Sample								
						٦ĭ	s.a. sumpto							Boring N	o.: B-29
Field Te	st Legend	d: Dila	atancy:	N - N	lone S	Slow	R - Rapid	Plasticity: NP - No	on-Plastic L - Lo	N M	- M	ediu	im	H - High	an I linh
NOTES	1) "nnd" -	I OU	ignness:	L - L	UW M-I		enetrometer reading			/iedit	im strer	H -	read	IVH-V	ery High
INUTES:	3.) Maximu	im Particle	sample av Size is de	termined	by direct c	bserva	ation within limitations of sa	impler size. 4.) Soil iden	tifications and field t	ests b	ase	d on	visua	il-manual i	methods per ASTM D2488.
MOT MAC	T DONAL	M	м								BORING NO.: B-29 Page 2 of 3				
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Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Loughness	Plasticity So L	Dry Strength	Remarks				
-	S-8 20.0'- 22.0'	12	12 17 22 20		SP	Dense, brown medium to fine SAND, trace Silt, dry (SP)	-	-	-	-					
- 25	S-9 25.0'- 27.0'	12	16 19 22 22		SP	Dense, brown coarse to fine SAND, little coarse Gravel, dry (SP)	-	-	-	-					
30 	S-10 30.0'- 32.0'	13	18 25 29 26		SP	Very dense, dark brown coarse to fine SAND, dry (SP)	-	-	-	-					
35 	S-11 35.0'- 37.0'	15	18 20 24 27		SP	Dense, brown coarse to fine SAND, trace fine Gravel, dry (SP)	-	-	-	-					
- 40	S-12 40.0'- 42.0'	15	17 19 25 25		SP	Dense, dark brown fine SAND, dry (SP)	-	-	-	-					
45 	S-13 45.0'- 47.0'	17	19 24 25 32		SP	Dense, dark brown fine SAND, little fine Gravel, moist (SP)	-	-	-	-					
	_	_	_	_	_		PRO 507	JEC 740	тт 186	NO.: 3 6-002	BORING NO.: B-29				
NOTES:	1.) "ppd" d 3.) Maximu	enotes so um Particl	il sample av e Size is de	verage dian termined b	netral pocke y direct obse	t penetrometer reading. 2.) "ppa" denotes soil sample average axial pock ervation within limitations of sampler size. 4.) Soil identifications and field	tests ba	trom ased	eter on	reading. visual-manu	• al methods per ASTM D2488.				

MOT MAC	T DONAL	м	м			SOIL BORING LOG						BORING NO.: B-29 Page 3 of 3
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
-					- 	<u>48.5</u>	-					
— 50 —	S-14 50.0'- 52.0'	15	21 28 28 35		CL	Hard, gray CLAY, moist (CL)	-	-	-	-		
-				////		52.0 End of Boring at 52 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.						
-												
- 60												
-												
-												
65 												
-												
70 												
-												
	4) Harry 10						 PRO 507	JE0 74(10.: 636	-002	BORING NO.: B-29
NUTES:	3.) Maximu	enotes so im Particl	e Size is de	verage dian termined by	direct obs	er perieu ometer reaging. 2.) "ppa" denotes soil sample average axial pocket servation within limitations of sampler size. 4.) Soil identifications and field te	pene sts ba	asec	on inter	reac visua	al-manual i	nethods per ASTM D2488.

MOT	r Donal	м	м				SO	DIL E	BORING LO	G						BORING NO.: B-30 Page 1 of 1
Project Locatio Client: Drilling	:: on: J Co.:	West Sp West Sp Townsh New En	pringfield- pringfield, ip of Wes gland Bor	Sewer Massac St Spring	Expansion hussets field	n Proj	iect			Project No.: Project Mgr: Field Eng. Stat Date/Time Sta	ff: rted:	-	507 Eric Coc Jur	7408 c Pa dy L ne 2	3636-002 auli ynes 4, 2019 a	9:50 am
Driller/ Elevation	Helper:): Grade ft	Scott M	ical Datum	il Chobo	t	Borin	a Location: In front of 3	36 \/alle	w View Circle	Date/Time Fini	Shed	ord.	Jur	ne 2 at: 4	4, 2019 a 2.134955	10:00 am Long: -72.651156
ltem		Casing	Samp	oler Co	re Barrel	Donni	g Location. In none of a	JU Valle			Но	rizoi	ntal	Datu	m: NAD 1	983
Type Length		HSA 5 ft		; t	-	Rig M	lake & Model: Mobile E	<u>B-53</u>	Cat-Head	Hammer Type		rillin Bent	ng F l onite	uid	Drill R	od Size: Casing Advance
Inside Di	a. (in.)	3.25	1.37	5	-		V 🛛 Geoprobe		Winch	Doughnut		Poly	mer			Hollow Stem Auger
Hammer	Wt. (Ib.) Fall (in.)	140 30	30)	-	Ll Tra □ Ski	ack ∐AirTrack id □		Roller Bit Cutting Head	Automatic		Wate None	er e			5
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo		Visual - Ma (Density/c constituents optional descrip	onsist consist s, partic otions,	dentification & Des ency, color, Group I cle size, structure, n geologic interpretat	c ription Name, noisture, ion, Symbol)				Drv Strength		Remarks
-	S-1 0.0'- 2.0'	14	19 16 18 19	* *	SW	0.3	Top (4") - ASPHALT Dense, brown coarse t	to fine \$	SAND, little coarse Gra	avel, dry (SW)			-	-	PID = 0.) tsf
-	S-2 2.0'- 4.0'	18	43 15 26 10		SP	2.0	Dense, light brown fine	e SANE	D, trace coarse Gravel,	dry (SP)		. .	-	-	PID = 0.	1 tsf
	S-3 4.0'- 6.0'	22	10 11 11 12		SP		Medium dense, light b	prown fii	ne SAND, trace coarse	e Gravel, dry (SP)			-	-	PID = 0.	1 tsf
-	S-4 6.0'- 8.0'	20	14 11 11 11		SP		Medium dense, light bi	prown m	nedium to fine SAND, t	trace Silt, dry (SP)		. .	-	-	PID = 0.	1 tsf
-	S-5 8.0'- 10.0'	21	12 15 14 14		SP		Medium dense, brown	n coarse	e to fine SAND, dry (SF	2)			-	-	Compos from 0 to	ite environmental sampled 10 feet BGS.
- 10 - -	S-6 10.0'- 12.0'	18	16 15 14 16		SP		Medium dense, brown	n coarse	e to fine SAND, dry (SF	?)		- -	-	-		
	S-7 15.0'- 17.0'	18	10 19 31 25		SP	17.0	Dense, brown coarse t	to fine S	SAND, dry (SP)					-		
-				· · · · ·			End of boring at 17 fee Borehole backfilled wit	et BGS. ith soil c	uttings and restored w	vith asphalt patch.						
		Water Le	evel Data	th in fe		1	Sample Type		Notes:						•	
Date	Time	⊢lapsed Time	Dep Bot. of	Bottom		-0-	Open End Rod		Groundwater not er	ncountered during	g drill	ing	activ	/itie	s.	
		(hr)	Casing	of Hole	Water	1.	Thin-Wall Tube									
						1.	Undisturbed Samp									
						188	Grab Sample	ie								
						٦Ľ	Jian Jample								Boring N	lo.: B-30
Field Te	st Legend	l: Dila	itancy:	N - N	one S-	Slow	R - Rapid	Plas	sticity: NP - N	on-Plastic L - Lo	w N	1 - N	/ledi	um	H - High	
	4.5.8	Tou	ighness:	L - Lo	ow M-N	/lediur	m H - High	Dry	Strength: N - No	ne L-Low M-	Medi	um	Η-	·Hi	gh VH-∖ 	/ery High
NOTES:	<u>1.) "ppd" d</u> 3.) Maximu	<u>enotes soil</u> ım Particle	sample av Size is de	erage dia termined	metral poc by direct of	<u>кеt pe</u> bserva	netrometer reading.	2.) "ppa of sampl	a [.] denotes soil sample ler size. 4.) Soil ider	average axial pock ntifications and field	et pen tests	etro base	mete ed or	er rea	ading. ual-manual	methods per ASTM D2488.

MOT	T DONAL	м	м					SOII	BORING LO	G						BORING NO.: B-31
Project	t:	West Sp	oringfield-	Sewer E	xpansio	n Pro	ject			Project No.:			507	4086	36-002	Page 1 of 1
Locatio	on:	West Sp	oringfield,	Massac	nussets					Project Mgr:		_	Eric	Pau	ıli	
Drilling	1 Co.:	New En	ip of Wes aland Bor	ina	ield					Field Eng. Staff Date/Time Starf	: ed:	-	<u>Cod</u> Julv	<u>y Ly</u> 11.	<u>nes</u> 2019 at 8	3:10 am
Driller/	Helper:	Scott Ma	arino /Em	il Chobot						Date/Time Finis	hed:		July	11,	2019 at 9	9:30 am
Elevation	1: Grade ft	Vert	ical Datum	i:	. Damel	Borin	g Location:	: Left end of Ca	ataumet Lane		Coo	ord.:	La	t: 42	.139939 L	ong: -72.6587301
Туре		HSA	Samp	bier Cor	- Barrei	Rig M	lake & Mod	el: Mobile B-5	3	Hammer Type	D	rillin	g Flu	uid	Drill Ro	d Size:
Length	a (in)	5 ft 3 25	2 fl	15	-	Tn 🗹	uck 🗆] Tripod	Cat-Head	□ Safety □ Dougbout		Bento	onite			Casing Advance
Hammer	Wt. (lb.)	140	140)	-		ack [Air Track	Roller Bit			Vate	r			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-	<u>⊔ Sk</u> 	id L		Cutting Head			lone ielc	Te	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbo		CC option	'isual - Manu (Density/con onstituents, p nal descriptio	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretati	cription Name, noisture, ion, Symbol)	Dilatancv	Toughness	Plasticity	Dry Strength		Remarks
-	S-1 0.0'- 2.0'	15	20 25 26 24		SP	0.3	Top (3") - A Very dense dry (SP)	ASPHALT e, brown coarse	e to fine SAND, little coarse	e to fine Gravel,		-	-	-	PID = 0.0	PPM
-	S-2 2.0'- 4.0'	12	17 10 8 6		SP		Medium de Gravel, dry	ense, brown co r (SP)	varse to fine SAND, little Si	It, trace fine	-	-	-	-	PID = 0.0	РРМ
	S-3 4.0'- 6.0'	8	4 3 1 1		SP		Very loose	, brown coarse	to fine SAND, trace fine G	Gravel, dry (SP)	-	-	-	-	PID = 0.0	PPM
-	S-4 6.0'- 8.0'	15	2 6 12 16		SP		Medium de	ense, brown co	earse to fine SAND, dry (SF	?)	-	-	-	-	PID = 0.0	PPM
-	S-5 8.0'- 10.0'	16	13 15 14 17		SP		Medium de (SP)	ense, brown co	varse to fine SAND, trace fi	ne Gravel, dry	-	-	-	-	PID = 0.0	РРМ
- 10 - -	S-6 10.0'- 12.0'	23	13 12 12 14		SP		Medium de dry (SP)	ense, light brov	vn coarse to fine SAND, tra	ace fine Gravel,	-	-	-	-		
	S-7 15.0'- 17.0'	11	16 11 15 30		SP	17.0	Medium de	ense, brown co	varse to fine SAND, little fin	ie Gravel, dry (SP)	-	-	-	-		
-							End of Bor Borehole b	ing at 17 feet E backfilled with s	GGS. soil cuttings and restored w	vith asphalt patch.						
		Water Le	evel Data	oth in fee	t to:	-	Sampl	e Type	Notes:	acountered durin -	drilli	00.0	otiv	tica		
Date	Time	Time	Bot. of	Bottom	Water		Upen Er	ia Kod all Tubo		countered auring	ann	ng a	CUV	ues	•	
		(hr)	Casing	of Hole	vvaler	-	Undistur	bed Sample								
						lss	Split Spr	sed Sample								
						G	Grab Sa	mple								
															Boring N	o.: B-31
Field Te	st Legend	d: Dila Tou	tancy: ghness:	N - N L - Lo	one S- w M-N	Slow /lediu	R - Rapi m H - Hig	d l gh	Plasticity: NP - No Dry Strength: N - Nor	on-Plastic L - Lov ne L - Low M - N	w N Nediu	∣-N Im	ediı H -	ım Higł	H-High า VH-V	'ery High
NOTES:	1.) "ppd" de 3.) Maximu	enotes soil um Particle	sample av	erage dia	netral poo	cket pe	enetrometer	reading. 2.)	"ppa" denotes soil sample ampler size 4) Soil iden	average axial pocke	t pen	etron	neter d on	read	ding. al-manual	methods per ASTM D2488

MOT		M	м				SOI	L BORING LO	G						BORING NO.: B-32
Projec Locatio Client: Drilling	t: on: g Co.:	West S West S Townsh New En	pringfield pringfield hip of Wes gland Bo	- Sewer E Massach st Springf ring	xpansior nussets ield	n Proj	ject		Project No.: Project Mgr: Field Eng. Staff Date/Time Starf	ted:		507 Eric Cod July	4086 Pau ly Ly / 10,	536-002 Jli nes 2019 at 2	Page 1 of 1
Driller/	Helper:	Scott M	arino /Em	il Chobot					Date/Time Finis	shed:		July	/ 10,	2019 at 3	3:49 pm
Elevation	 Grade ft 	. Vert Casing	ical Datun	1: Dier Corr	Barrel	Boring	g Location: Right end of	Cataumet Lane		Coo	rd.:	La tal D	it: 42 Datum	.1398515	Long: -72.65587089
Туре		HSA	SS	3	-	Rig M	ake & Model: Mobile B-	53	Hammer Type	Dr	illin	g Flu	uid	Drill Ro	d Size:
Length Inside Di	a. (in.)	5 ft 3.25	2 f	t 75	-	Tru ∟ רע ר	ick ∐ Tripod V □ Geoprobe	☐ Cat-Head ☐ Winch	Safety Doughput		entc olvn	nite 1er			Casing Advance
Hammer	Wt. (lb.)	140	14	2	- [Tra	ick 🛛 Air Track	Roller Bit	Automatic	ΠV	/ate	r			Hollow Stem Auger
Hammer		30			- 11					F	<u>one</u> ield	Те	sts		
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Group Symbol	1	Visual - Man (Density/con constituents, p optional descriptio	ual Identification & Des nsistency, color, Group I particle size, structure, n ons, geologic interpretat	c ription Name, noisture, ion, Symbol)	Dilatancy	Toughness	Plasticity	Dry Strength		Remarks
-	S-1 0.0'- 2.0' S-2	12	10 8 12 14 28		SM SM	0.4	Top (5") - ASPHALT Medium dense, brown S Gravel, dry (SM) Very dense, brown Silty	ilty coarse to fine SAND, lit	tle coarse to fine coarse to fine		-	-	-		
_	2.0'- 4.0'		27 31 23		•	4.0									
5	S-3 4.0'- 6.0'	16	12 16 24 25		ML	6.0	Hard, brown SILT, some	coarse to fine Gravel, mois	st (ML)	-	-		L	PP = 3.2	5 tsf
_ <u>V</u>	S-4 6.0'- 8.0'	3-4 12 28 0 0 GM Very dense, brown coarse to fine GRAVEL, some Silt, trace fine -													
-	S-5 8.0'- 10.0'	8	21 20 35 19		GM	10.0	Very dense, brown coars Sand, dry (GM)	se to fine GRAVEL, some S	ilt, trace fine	-	-	-	-	Cobble o at 7.5 fee	boulder likely encountered t BGS.
10 	S-6 10.0'- 12.0'	13	23 32 36 34		ML	10.0	Hard, brown SILT, some	coarse to fine Gravel, mois	it (ML)	-	-	L	L	PP = 4.0	tsf
-						<u>13.5</u>									
- 15	S-7 15.0'- 17.0'	12	55 52 42 58		GM	17.0	Very dense, brown coars	se to fine GRAVEL, some S	iilt, dry (GM)	-	-	-	-		
-							Borehole backfilled with	soil cuttings and restored w	vith asphalt patch.						
		Water Le	evel Data	oth in fee	t to:	-	Sample Type	Notes:	ed at 7 fact PCC	Soil-		201-	tont	with cla-	
Date	Time	Time	Bot. of	Bottom	Wator		Open End Rod	throughout boring.	eu al 7 1661 BGS.	SOIIS	00	1515	ient	with glac	iai iiii yeology observed
7/10/10	3.10	(hr)	Casing	of Hole	7		Undisturbed Sample								
1110/18	0.10	-	10.0	17.0		ss	Split Spoon Sample								
						G	Grab Sample								
							-							Boring N	o.: B-32
Field Te	st Legen	d: Dila	atancy:	N - No	one S-	Slow	R - Rapid m H - High	Plasticity: NP - N	on-Plastic L - Lo	w M Mediu	- M m	ediu H -	um Hiat	H - High	ery High
NOTES	h "baa" (.1	enotes soil	iginicaa. I sample av	erade diar	netral noc	ket ne	netrometer reading 2) "ppa" denotes soil sample	average axial nocke	t pene	trom	neter	r read	dina.	
	3.) Maximu	Im Particle	Size is de	termined b	y direct ob	serva	tion within limitations of s	ampler size. 4.) Soil ider	tifications and field t	ests b	ased	don	visua	al-manual i	methods per ASTM D2488.

MOT		м	м					SOI	L BORING LO	DG						BORING NO.: B-33
Project	t:	West S	prinafield.	Sewer F	-xpansic	on Pro	iect			Project No.:			507	40	3636-002	Page 1 of 1
Locati	on:	West S	pringfield,	Massac	hussets		J			Project Mgr:			Erio	c Pa	auli	
Client:	-	Townsh	ip of Wes	t Spring	ield					Field Eng. Stat	f:	-	Co	dy L	ynes	
Drilling	g Co.: Holpori	New En	gland Boi arino /Em	ing il Chobo	+					Date/Time Star	rted:		Jul	y 12	2, 2019 at : 2010 at	2:40 pm 1:00 pm
Elevation	1: Grade ft	Vert	ical Datum	11 ONODO 1:		Borir	ng Location	. In front of 21	5.lefferv Lane	Date/Time Fill	Cod	ord.	: L	at: 4	2.1386621	Long: -72.6590252
ltem	-	Casing	Sam	oler Cor	e Barrel	Born					Hor	izo	ntal	Dati	m: NAD 19	983
Type Length		HSA 5 ft		; t	-		Make & Moo	del: Mobile B-	53	Hammer Type		rilli ı Rent	1g F l	uid	Drill Ro	d Size: Casing Advance
Inside Di	a. (in.)	3.25	1.37	5	-			Geoprobe		Doughnut		Poly	mer	•		Hollow Stem Auger
Hammer Hammer	Wt. (Ib.) Fall (in.)	140 30	30)	-		ack L kid [」 Air Track]	Roller Bit Cutting Head	☐ Automatic		Nate None	er Ə			······
	Sample						,	/ieual - Mani	ual Identification & Des	cription	F	Fiel	d Te	sts		
Depth/ Elev. (ft)	No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	Group Symbo	S D D	c optio	(Density/cor onstituents, p nal descriptio	nsistency, color, Group particle size, structure, i pns, geologic interpreta	Name, moisture, tion, Symbol)	Dilatancv	Touchnee	Plasticity	Drv Strendth		Remarks
	S-1	24	13			0.4	Top (5") -	ASPHALT			-			-		
	0.0'- 2.0'		14 8		SP		Medium d	lense, brown c el. drv (SP)	oarse to fine SAND, little S	ilt, little coarse to						
_			11					, , ,								
					·											
	S-2	15	7		SP		Medium d	lense, brown c	oarse to fine SAND, little co	oarse to fine	-		· -	-		
	2.0'- 4.0'		5		÷			ice ont, dry (or)							
			9		•											
					.]											
	S-3	13	8		SP		Medium d	lense, brown fi	ne SAND, little Silt, trace fi	ne Gravel, dry (SP)	-	. -	· -	-		
	4.0'- 6.0'		9													
-			8		·											
-																
	S-4	6	7		SP		Medium d (SP)	lense, brown fi	ne SAND, some coarse to	fine Gravel, dry	-		· -	-		
-	6.0'- 8.0'		8													
			3		·											
-	0.5	10	2			8.0	Modium d	langa brown C	Travelly against to find SANI							tof
	5-5	12	7				trace Silt,	moist (SC)	avely coarse to line SAN	D, some Clay,	-		-		PP = 3.0	ISI
-	8.0'- 10.0'		13	/././.	1											
			26	////												
102-	S-6	15	32		sc		Verv dens	e. brown Grav	ellv coarse to fine SAND. s	ome Clav. wet	-		. .	.	PP = 4.0	tsf
	10.0'-	-	43				(SC)	, -	,	- ,,						
-	12.0'		50/4		1											
				/././.												
-				////												
-				//////		13 5	5									
				ŀÝĆ	<u>y</u>											
-				$\mathbb{C}^{\mathbb{C}}$	1											
15																
15	S-7	1	50/2		GP		Very dens	e, brown coars	se to fine GRAVEL, wet (G	P)	-		· -	-		
L	15.0'-			p n]											
	17.0			60 C	S											
L				0°	4											
				60	1											
L				b	Y											
	18.0'-'			50,<							-		· -	-	Cobbles encounte	and/or boulders red at 15 feet BGS.
F					\										Roller bit	to 20 feet BGS.
				$ \circ \circ \rangle$			End of Bo	ring at 20 feet	BGS.							
		Waterla	evel Data	K	1	20.0) Borehole Samp	Dackfilled with	cuttings and restored with	asphait patch.					1	
_		Elapsed	Dep	oth in fee	et to:	10	Open E	nd Rod	Groundwater infer	red at 10 feet I	BGS.	S	oils	со	nsistent v	vith glacial till geology
Date	Time	Time (hr)	Bot. of Casing	Bottom	Water	r T	Thin-W	all Tube	observed througho	ut boring.						
7/12/19	0:00	-	12.0	12.0	10	Jυ	Undistu	rbed Sample	•							
						_ss	Split Sp	oon Sample								
						G	Grab Sa	ample							Borina N	o.: B-33
Field Te	st Leaena	l. d: Dila	l itancy:	I N - N	I one S-	Slow	R - Rap	id	Plasticity: NP - N	Ion-Plastic L - Lo	w M	1 - N	/ledi	um	H - Hiah	
		Tou	ighness:	L - Lo	w M-I	Mediu	m H-Hi	gh	Dry Strength: N - No	one L-Low M-	Mediu	um.	H-	Hi	gh VH-\	/ery High
NOTES:	1.) "ppd" d 3.) Mavimu	enotes soil im Particlo	sample a	erage dia	metral po	cket pe	enetrometer ation within	r reading. 2.) "ppa" denotes soil sample ampler size 4) Soil ide	e average axial pock	et pen	etro	mete	r re	ading. Jal-manual	methods per ASTM D2/88
	0. j waxiiii	ann a annole	0120 13 UP	commed i	y uneur l	, J 3 CI Ve	AUGH WIUIIII	miniations of S	ampici 3120. 4./ 3011 108	nanoauons anu nelu	.00101	Just	u UI	113	aar-manudi	11011003 per A0 HVI D2400.

MOT	T DONAL	м	м					SOII	L BORING LO	G						BORING NO.: B-33A
Project	t:	West Sp	oringfield	- Sewer	Expansio	on Pro	ject			Project No.:			507	740	08636-002	Fage For F
Locatio	on:	West Sp	oringfield,	Massa	chussets					Project Mgr:		-	Eric	c P	Pauli	
Drilling	1 Co.:	New En	gland Bor	ring	glieid					Date/Time Start	: ed:	-	Jul	uy v 1	2, 2019 at	9:40 am
Driller/	Helper:	Scott Ma	arino /Em	il Chob	ot					Date/Time Finis	hed		Jul	y 1	2, 2019 at	10:23 am
Elevation	 Grade ft 	. Verti	ical Datum	1: 		Borin	ng Locatio	on: In front of 93 (Green Meadow Lane		Co	ord.	: L	at:	42.1109652	Long: -72.6572227
Туре		HSA	Samp	Sier C	-	Rig N	lake & Mo	odel: Mobile B-5	3	Hammer Type	D	rillin	ntal I ng Fl	Dat	d Drill R	od Size:
Length	a (in)	5 ft	2 f	t 75	-	Tn	uck		Cat-Head	Safety		Bent	tonite	Э		Casing Advance
Hammer	a. (iii.) Wt. (lb.)	140	1.57	5	-		v ack	Air Track	Roller Bit	Automatic		Nate	er			Hollow Stem Auger
Hammer	Fall (in.)	30	30		-		id		Cutting Head			None Tiple	e d Te	ete	•	
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratu Graph	m ic Symbo	S p ol	opti	Visual - Manu (Density/con constituents, p onal descriptio	al Identification & Des sistency, color, Group I article size, structure, n ns, geologic interpretat	cription Name, noisture, ion, Symbol)	Dilatance		Plasticity		Dry Strength 6	Remarks
-	S-1 0.0'- 2.0'	8	12 15 18 12		SP	0.3	Top (4") Dense, I dry (SP)	- ASPHALT ight brown coarse	e to fine SAND, some coar	rse to fine Gravel,					-	
-	S-2 2.0'- 4.0'	18	17 14 16 19		SP		Dense, y	vellowish red coa	rse SAND, dry (SP)						-	
	S-3 4.0'- 6.0'	17	13 15 18 18		SP	6.0	Dense, b	orown coarse to f	îne SAND, dry (SP)				- -		-	
-	S-4 6.0'- 8.0'	24	17 18 21 21		SM	0.0	Dense, t	prown medium to	fine SAND, some Silt, mo	ist (SM)	.				-	
-	S-5 8.0'- 10.0'	20	12 20 20 55		SM	10.0	Dense, t	prown medium to	fine SAND, some Silt, mo	vist (SM)			. -		-	
	S-6 10.0'- 12.0'	24	13 21 22 26		ML		Hard, bro	own SILT, some t	fine Sand, moist (ML)						- PP = 1.) tsf
- - 	S-7 15.0'- 17.0'	12	14 21 27 31		ML		Hard, bro	own SILT, some i	coarse to fine Gravel, wet ((ML)					- PP > 4.	5 tsf
-						17.0) End of B Borehole	Boring at 17 feet E e backfilled with s	3GS. soil cuttings and restored w	vith asphalt patch.						
		Water Le	evel Data	oth in f	et to:	-	Sam	ple Type	Notes:	rad at 15 f+ D	00				onoiste	
Date	Time	Time	Bot. of	Botto	n wata	<u>_</u>]°	Open I		observed throughou	ied at 15 feet B ut boring.	ଓଟ୍ଟ.	S	OIIS	C	onsistent	wiui giacial till geology
7/10/10	10.15	(hr)	Casing	of Ho	e vvate	4.	I NIN-V	vall I UDE		-						
1/12/19	10:15	-	15.0	17.0	15		Split S	poon Sample								
							Grab S	Sample								
						Ľ		•							Boring	No.: B-33A
Field Te	st Legend	d: Dila Tou	tancy: ghness:	N - L - I	None S- ow M-	- Slow Mediu	R-Ra m H-F	ipid ligh	Plasticity: NP - N Dry Strength: N - No	on-Plastic L - Lov ne L - Low M - N	w N Nedi	1 - N um	Леdi Н-	um - H	n H-High ligh VH-	n Very High
NOTES:	1.) "ppd" d	enotes soil	sample av	/erage d	ametral po	cket pe	enetromet	er reading. 2.)	"ppa" denotes soil sample	average axial pocke	t pen	etro	mete	er re	eading.	
	3.) Maximu	ım Particle	Size is de	termined	by direct of	observa	ation within	n limitations of sa	ampler size. 4.) Soil ider	ntifications and field to	ests I	base	ed or	ı vis	sual-manua	methods per ASTM D2488.

Product Statel Strandfold Storent Extension Privat Private Name Strandfold Storent Extension Privat Private Name Strandfold Storent Extension Privat Strandfold Storent Extension Private Stra	MOT		м	м					SO	L BORING LC	DG						BORING NO.: B-35
Drink Junit Data Hash Briteries	Project Locatio Client:	t: on:	West Sp West Sp Townsh	oringfield- oringfield, ip of Wes	Sewer Massad	Expansic chussets field	on Pro	ject			Project No.: Project Mgr: Field Eng. Staff	:	-	507 Eric Coc	4086 Pau ly Ly	036-002 Ili nes	Page 1 of 2
Devices Vertex Description Description Description Const. Last & 4.0400 km model Const. Const. <th< td=""><td>Drilling Driller/</td><td>g Co.: 'Helper:</td><td>New En</td><td>gland Bor arino /Em</td><td>ing il Chobo</td><td>ot</td><td></td><td></td><td></td><td></td><td>Date/Time Start Date/Time Finis</td><td>ted: shed:</td><td>-</td><td>July</td><td>/ 16, / 16.</td><td>2019 at 1 2019 at 1</td><td>1:00 am</td></th<>	Drilling Driller/	g Co.: 'Helper:	New En	gland Bor arino /Em	ing il Chobo	ot					Date/Time Start Date/Time Finis	ted: shed:	-	July	/ 16, / 16.	2019 at 1 2019 at 1	1:00 am
Internet Cathy Simple Ore Barrel Mate Model	Elevation	1: Grade ft	Vert	ical Datum	:		Borin	g Location	: Piper Road	past Brush Hill, close to stre	eam	Cod	ord.:	La	at: 42	.1401617	Long: -72.6447237
Longen 2 /s 2 /s <th2 s<="" th=""> 2 /s 2 /s <</th2>	Item			Samp	oler Co	re Barrel	Pia M	lako & Mod	ol: Mobilo P	52	Hammor Typo	Hor	rizor rillir	ntal E	Datun	n: NAD 19	83 d Sizo:
Interference Construction Construction<	Length		5 ft	2 f	t	-	Tr Tr	uck	Tripod	Cat-Head	Safety		Bent	onite	uiu	Driir Ko	Casing Advance
Hermiter Halo So So Control free Control free Model Model<	Inside Di Hammer	a. (in.) Wt (lb.)	3.25 140	1.37	'5)	-		V ⊑ ack ⊑	Geoprobe	Winch Roller Bit			Polyı Mate	mer			Hollow Stem Auger
Berry Print Service With Network Service Statute Service Statute Service Statute With Level Statute Print Network Field Tests 0 0.7.2 rd 1 1 1 0.5. Te (17)-ASPHULT Service Statute Service Statute <td>Hammer</td> <td>Fall (in.)</td> <td>30</td> <td>30</td> <td></td> <td>-</td> <td></td> <td>id D</td> <td></td> <td>Cutting Head</td> <td></td> <td></td> <td>None</td> <td>9</td> <td></td> <td></td> <td></td>	Hammer	Fall (in.)	30	30		-		id D		Cutting Head			None	9			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratur Graphi	uSCS Group Symbo	S D DI	V cc optior	'isual - Man (Density/co onstituents, nal description	ual Identification & Des nsistency, color, Group particle size, structure, i ons, geologic interpretat	scription Name, moisture, tion, Symbol)	Dilatancv		Plasticity all	Dry Strength		Remarks
8-2 13 10 0/W Medium drive, brownith yillow coates to the GRAVEL, some the - - - - -	-	S-1 0.0'- 2.0'	17	14 18 15 12		SW	0.5	Top (6") - A Dense, bro (SW)	ASPHALT	fine SAND, some coarse to	o fine Gravel, dry	-		-	-		
5-3 12 15 GW Dements bown coarse to fine GRAVEL, some coarse to fine Sand, into Situ, by (GW) 0 Dements drive (GRAVEL, some coarse to fine Sand, do (GRAVEL, some coarse to fine Sand, do (GRAVEL, some fine Sand, dy (ML) 1	-	S-2 2.0'- 4.0'	13	10 6 6 7		GW		Medium de Sand, little	ense, brownis Silt, dry (GW	h yellow coarse to fine GR/)	AVEL, some fine	-		-	-		
3-4 24 13 Image:	5	S-3 4.0'- 6.0'	12	15 19 15 11		GW	6.0	Dense, brc little Silt, d	own coarse to ry (GW)	fine GRAVEL, some coars	e to fine Sand,	-		-	-		
S-5 20 2 4 4 6 PP = 1.0 sf S-6 20 2 4 6 1 ML Medium stift, brown SiLT, some fine Sand, moist (ML) - - L L PP = 1.0 sf S-7 20 7 7 7 1 ML Stift, brown SiLT, some fine Sand, wet (ML) - - L L PP = 1.0 sf	_	S-4 6.0'- 8.0'	24	13 9 7 7		ML		Very stiff, t	orown SILT, tr	ace fine Sand, dry (ML)		-			L	PP = 1.0	tsf
See 24 4 4 1 Sett, brown SiLT, some fine Sand, wet (ML) - - L L L PP = 1.0 tsf 10.0 ⁻¹ 7 7 1	-	S-5 8.0'- 10.0'	20	2 4 4 6		ML		Medium st	iff, brown SIL	T, some fine Sand, moist (N	ML)	-			L	PP = 1.0	tsf
15 5.7 20 3 13.5 13.5 15 5.7 20 3 2 13.5 15 5.7 20 3 2 13.5 15 5.7 20 3 2 13.5 17 4 3 2 13.5 10.00000000000000000000000000000000000	1 02 	S-6 10.0'- 12.0'	24	4 5 7 7		ML		Stiff, brown	n SILT, some	fine Sand, wet (ML)		-		L	L	PP = 1.0	tsf
- Water Level Data Sample Type Notes: Date Time Elapsed (hr) Depth in feet to: Casing O Open End Rod T Groundwater inferred at 15 feet BGS. Soils consistent with glacial till geology observed throughout boring. 7/16/19 0:00 - 22.0 0 U Undisturbed Sample SS Grab Sample U Grab Sample U Grab Sample Destrictiv: Destrictiv: No.es: Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low M - Medium H - High Plasticity: Dry Strength: N - None L - Low M - Medium H - High Provident for the function of the function	- 15 	S-7 15.0'- 17.0'	20	3 2 4 3		SM	13.	5		D, some Silt, wet (SM)				_	-		
Water Level Data Sample Type Notes: Date Elapsed Depth in feet to: Bot. of (hr) O Open End Rod Groundwater inferred at 15 feet BGS. Soils consistent with glacial till geology 7/16/19 0:00 - 20.0 22.0 10 T Thin-Wall Tube U Undisturbed Sample 7/16/19 0:00 - 20.0 22.0 10 U Undisturbed Sample 6 Grab Sample S Split Spoon Sample S Split Spoon Sample 6 Grab Sample G Grab Sample Boring No.: B-35 Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low Plasticity: N - None L - Low N - None L - Low M - Medium H - High NOTES: 1.) "pd" denotes soil sample average diametral pocket penetrometer reading. 2.) "pa" denotes soil sample average axial pocket penetrometer reading. 2.) "pa" denotes col sample average axial pocket penetrometer reading. 0. Marinem Particle Date in addressing to the particle within limiting within limiting of addressing and proven and bot to boon of the particle size addressing average axial pocket penetrometer reading. 2.) "pa" denotes col sample average axial pocket penetrometer reading.	_					· · · ·	<u>18.</u>	5				_					
Date Time Time Bot. of (hr) Bot. of Casing Bottom of Hole Water T Thin-Wall Tube U Undisturbed Sample 7/16/19 0:00 - 20.0 22.0 10 U Undisturbed Sample observed throughout boring. 8 Split Spoon Sample G Grab Sample G Grab Sample Boring No.: B-35 Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low Plasticity: Dry Strength: NP - Non-Plastic L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High Dry Strength:<			Water Le	evel Data Der	oth in fe	et to:	+-	Sampl	e Type	Notes: Groundwater infer	rred at 15 feet R	GS		oile	COP	sistent w	vith glacial till geology
Image: construction of the construc	Date	Time	Time	Bot. of	Botton	Wate		Thin-W	all Tube	observed througho	but boring.	00.	0	5110	501	SIGLOFIL W	grasiai illi geology
Image: State of the state	7/16/19	0:00	(nr) -	20.0	of Hole 22.0	10	\dashv	Undistur	bed Sample								
Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid H - High Plasticity: Dry Strength: NP - Non-Plastic L - Low M - Medium H - High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading.	., 10, 10	5.00		_0.0			∃ss	Split Spo	oon Sample								
Field Test Legend: Dilatancy: Toughness: N - None S - Slow R - Rapid L - Low M - Medium H - High Plasticity: Dry Strength: NP - Non-Plastic L - Low M - Medium H - High Boring No.: B-35 NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average average diametral pocket penetrometer reading.						+	G	Grab Sa	mple							.	D 45
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average availapocket penetrometer reading. 2.) "ppa" denotes soil sample average availapocket penetrometer reading.	Field Te	st Legen	d: Dila	tancv:	N - N	lone S.		R - Rani	d	Plasticity: NP - N	Ion-Plastic I - Lo	wN	1 - 1	ledi	um	Boring N H - Hiah	o.: B-35
NOTES: 1.) "ppd" denotes soil sample average diametral pocket penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket penetrometer reading.		Logon	Tou	ghness:	L-L	ow M-I	Vediu	m H - Hig	gh	Dry Strength: N - No	one L - Low M - I	Vedi	um	Η-	Hig	י VH - V	ery High
3. Lividation of diluce alze is determined by direct observation within himitations of sampler size 4 Labor reminications and tierd tests based on visual-manual methods for ASTM 17//XX	NOTES:	1.) "ppd" d 3.) Maximu	enotes soil um Particle	sample av	erage dia	ametral po	cket p	enetrometer	reading. 2) "ppa" denotes soil sample sampler size 4) Soil idea	e average axial pocke ntifications and field t	t pen	etror	nete	r read	ding. al-manual i	methods per ASTM D2488

MOT MAC	T DONAL	M	м			SOIL BORING LOG						BORING NO.: B-35 Page 2 of 2
Depth/ Elev. (ft)	Sample No. / Interval (ft)	Rec. (in)	Sample Blows per 6"	Stratum Graphic	USCS Symbol Group	Visual - Manual Identification & Description (Density/consistency, color, Group Name, constituents, particle size, structure, moisture, optional descriptions, geologic interpretation, Symbol)	Dilatancy	Toughness	Plasticity Set	Dry Strength		Remarks
-	S-8 20.0'- 22.0'	24	3 4 5 5		ML	Stiff, gray SILT, little fine Sand, moist (ML)	-	-	L	L	PP = 1.5	tsf
-						End of Boring at 22 feet BGS. Borehole backfilled with soil cuttings and restored with asphalt patch.						
-												
-												
— 30 —												
-												
- 35												
-												
-												
— 40 —												
-												
_ 45												
-							PRC			NO.	:	BORING NO.:
NOTES:	1.) "ppd" d	enotes so	il sample av	verage diar	metral pock	et penetrometer reading. 2.) "ppa" denotes soil sample average axial pocket	507	/4(536	5-002	B-35
L	3.) Maximu	um Particle	e Size is de	termined b	y direct ob	servation within limitations of sampler size. 4.) Soil identifications and field te	sts b	asec	1 on	visu	ai-manual	methods per ASTM D2488.

Mott MacDonald | West Springfield Sewer Expansion Project









US Arrny Corps of Engineers VALIDATED LABORATORY

GEOTECHNICAL LABORATORY TESTING RESULTS

CLIENT: Mott MacDonald

MC # 19C002604F DATE: August 9, 2019

PAGE: 1 of 1

111 Wood Ave South Iselin, NJ 08830-4112 West Springfield, MA Job No. 507408636

PROJECT: West Springfield Sewer Expansion

ATTN: Mr. Eric Pauli, P.E.

CHECKED BY: Eduardo M. Freire, P.E. TITLE: Geotechnical Laboratory Manager

SAMPLES RECEIVED: July 23, 2019

SAMPLES TESTED:

7/23/19 - 8/7/19

LAB TECHNICIAN(S): J. Veach, J. Landy & K. Perry

t Boring No.	ample No.	Jepth (ft)	r Content (%) TM D2216)	At (A	terberg Lim	its 8)	e Size Analysis eve Only)* STM D422)	e Size Analysis Hydrometer* STM D422)	ic Content (%) TM D2974)	Sulfate m (mg/kg)) STM D516)	Chloride m (mg/kg)) TM D512B)	bH of Soil STM G51)	rsolidation* TM D2435)	U Triaxial* :TM D2850)	U Triaxial* :TM D4767)	Soil Perm. Class Pating	(NJAC 7:9A-6.3)		
Tes	ŭ	1	Wate (AS	Liquid Limit (LL)	Limit (PL)	Index (PI)	Particle (Si (AS	Particle with (A\$	Organ (AS	(AS Ag)	(Pp (AS	A A)	Coi (AS	UI (AS	CI (AS	А	В		
B-01	S-7	15-17					PSA-1												
B-02	S-4	6-8	14.5	24	13	11													
B-10	S-6	10-12					PSA-2												
B-04	S-6	10-12						PSA-3											
B-16	S-6	10-12	17.5				PSA-4												
B-33A	S-4	6-8	22.6				PSA-5												
B-31	S-2	2-4					PSA-6												
B-32	S-2	2-4	18.4					PSA-7											
B-28	S-6	10-12					PSA-8												
B-22	S-7	15-17					PSA-9												
B-08	S-7	15-17					PSA-10												
B-19	S-5	8-10	16.1	26	17	9													
B-20	S-5	8-10					PSA-11												
B-15	S-3	4-6	11.9	21	16	5													
B-26	S-6	15-17					PSA-12												
B-29	S-6	10-12	34.0	32	18	14													
B-30	S-4	6-8					PSA-13												
B-06	S-7	15-17	15.1					PSA-14											
B-07	S-4	6-8	11.5				PSA-15												
B-05	S-5	8-10	12.7				PSA-16												
B-11	S-4	6-8					PSA-17												
B-14	S-6	10-12					PSA-18												
B-33	S-5	8-10	13.9				PSA-19												
B-12	S-6	10-12	31.6				PSA-20												
B-09	S-6	10-12	12.8				PSA-21												
B-35	S-4	6-8					PSA-22												
B-29	S-8	20-22						PSA-23											
	Bi	lling Total:	9		4		19	4											
Comments	/Remarks:	* See attac	ned Plate(s)															















































ATLANTIC TESTING LABORATORIES

WBE certified company

CORROSIVITY ANALYSIS OF SOIL AWWA Specification C105/A21.5-10 Appendix A

Page 1 of 2

PROJECT INFORMATION

MOTT MacDONALD NY, INC. Client: Project: 2019 Laboratory Testing **Carley Farm Solar** Jamesville, New York

ATL Report No.: **Report Date:** Date Received:

RT1684SL-095-07-19 August 2, 2019 July 30, 2019

			Tabulat		CONUSIV	e Allalysis (51 5011 Kes	Suits			
Sample	Depth	Resistivity				Redox				Moisture	Total
ID	(ft)	(Ωcm)	Points*	рН	Points*	Potential	Points*	Sulfides	Points*	Points	Points**
B-01, S-5	8-10	1,806	5	7.0	0	218	0	Negative	0	1	6
B-01, S-6	10-12	32,250	0	7.7	0	148	0	Negative	0	1	1
B-11, S-5	8-10	12,642	0	7.1	0	168	0	Negative	0	1	1
B-11, S-6	10-12	27,090	0	7.2	0	196	0	Negative	0	1	1
B-14, S-5	8-10	19,350	0	7.1	0	199	0	Negative	0	1	1
B-14, S-7	15-17	4,644	0	5.7	0	185	0	Negative	0	1	1
B-16, S-3	4-6	412,800	0	7.6	0	233	0	Negative	0	0	0
B-16, S-4	6-8	92,880	0	7.3	0	212	0	Negative	0	1	1
B-29, S-9	25-27	10,578	0	7.4	0	217	0	Negative	0	1	1
B-29, S-10	30-32	9,804	0	7.6	0	55	3.5	Negative	0	1	4.5
B-31, S-1	0-2	24,510	0	7.7	0	192	0	Negative	0	1	1
B-31, S-3	4-6	19,350	0	7.6	0	125	0	Negative	0	1	1

Tabulation of Corrosive Analysis of Soil Results

See Table A.1 Soil-test Evaluation of AWWA Specifications C105/A21.5-10 attached.

Reviewed By: Judy a. anes

Date:

August 2, 2019

ATL Report No. : RT1684SL-095-07-19 Client: MOTT MacDONALD NY, INC. Date: August 2, 2019 Page: 2 of 2

AWWA Specifications C105/A21.5-10 - Polyethylene Encasement for Ductile-Iron Pipe Systems

Table A.1 Soil-test Evaluation

Soil (Characteristics Based on Samples Taken Down to Pipe Depth	Points*
Resis	stivity - ohm-cm (based on water saturated soil box)	
	< 1,500	10
	<u>≥</u> 1,500 - 1,800	8
	>1,800 - 2,100	5
	>2,100 - 2,500	2
	>2,500 - 3,000	1
	>3,000	0
pH:	0 - 2	5
	2 - 4	3
	4 - 6.5	0
	6.5 - 7.5	0+
	7.5 - 8.5	0
	>8.5	3
Redo	ox Potential:	
	> +100 mV	0
	+50 to +100 mV	3.5
	0 to +50 mV	4
	Negative	5
Sulfi	des:	
	Positive	3.5
	Trace	2
	Negative	0
Mois	sture:	
	Poor drainage, continuously wet	2
	Fair drainage, generally moist	1
	Good drainage, generally dry	0

* Ten points or greater indicates that soil is corrosive to ductile-iron pipe; protection is needed.

+ If sulfides are present and low (<100 mv) or negative redox-potential results are obtained, add three points points for this range.
SECTION 00410 BID FORM

SECTION 00410 BID FORM

BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT CWSRF-4513 CONTRACT NUMBER 1 TOWN BID NO. 20-0013

1. <u>BID RECIPIENT</u>

- a. This Bid is submitted to: Department of Public Works Town of West Springfield 26 Central Street West Springfield, MA 01089
- b. The undersigned Bidder proposes and agrees, if this Bid is accepted and the Contract awarded to Bidder, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2. <u>BIDDER'S ACKNOWLEDGEMENTS</u>

- a. Bidder declares that the only persons or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm or corporation; that the Bidder has carefully examined the location of the proposed work, the proposed form of contract, the standard specifications and plans therein referred to and the Special Provisions hereto attached; and Bidder proposes and agrees, if this proposal is accepted, that Bidder will contract with the Town of West Springfield, in the form of contract contained herein, and that Bidder will take in full payment the unit prices attached to this Bid Form.
- b. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The time period for holding bids, where Federal approval is not required is 30 days, Saturdays, Sundays and legal holidays excluded, after opening of bids and where Federal approval is required, the time period for holding bids is 30 days, Saturdays, Sundays, Sundays and holidays excluded after Federal approval. Bidder will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within ten (10) days after the date of Owner's Notice of Award.
- c. Bidder acknowledges that a Labor and Material or Payment Bond in the amount of 100-percent of the total contract price shall be provided by the Contractor.
- d. Bidder acknowledges that a Performance Bond in the amount of 100-percent of the total contract price shall be provided by the Contractor.
- e. The time for completion of this contract is 470 calendar days. Liquidated damages specified in this contract are \$2,000 per day for each calendar day beyond the contract completion date that work remains uncompleted.

- f. The Work under this Contract shall be subject to the provisions of Chapter 30, Section 39M of the Massachusetts General Laws.
- g. Bidders must fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons). Contractors, subcontractors, or suppliers that appear on the Excluded Parties List System at <u>https://www.dol.gov/ofccp/regs/compliance/preaward/debarlst.htm</u> are not eligible for award of any contracts funded by the Massachusetts State Revolving Fund.

3. <u>BIDDER'S REPRESENTATIONS</u>

In submitting this Bid, Bidder represents that:

a. Bidder has examined and carefully studied the Bidding Documents, including but not limited to the Drawings, Specifications, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date

- b. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- c. Bidder is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress and performance of the Work.
- d. Bidder has considered the information known to Bidder, information and observations obtained from visits to the Site, information commonly known to contractors doing business in the locality of the Site, and the Bidding Documents with respect to the effect of such information and observations on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- e. Based on the information and observations referred to in the preceding paragraph, the Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- f. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- g. Bidder is prepared to comply with the applicable requirements of Owner's safety program, if any.
- h. Bidder has given Owner and/or Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Owner and/or Engineer is acceptable to Bidder.

- i. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- j. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.
- k. Bidder is aware that the estimated quantities on the Bid Form are subject to Article 13.03 of the General Conditions.

4. <u>BIDDER'S CERTIFICATION</u>

Bidder certifies that:

- a. 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, that all employees to be employed at the Site will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 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, and that Bidder will comply fully with all laws and regulations applicable to awards made subject to MGL Chapter 30 Section 39M.
- b. Pursuant to M.G.L.c.62C, s49A 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.
- c. Bidder certifies it will comply with the specific affirmative action steps contained in the EEO/AA provisions of this Contract, including compliance with the Disadvantaged Business Enterprise provisions as required under these contract provisions. The contractor receiving the award of the contract shall incorporate the EEO/AA provisions of this contract into all subcontracts and purchase orders so that such provisions will be binding upon.
- d. Under penalty of perjury, Bidder certifies it is not presently debarred from doing public construction work in the Commonwealth under the provisions of MGL Chapter 29, Section 29F or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder; and is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.
- e. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation.
- f. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
- g. Bidder has not solicited or induced any individual or entity to refrain from bidding.
- h. Bidder has not engaged in corrupt, fraudulent, collusive or coercive practices in competing for the Contract. For the purposes of this Paragraph:
 - 1. "Corrupt practice" means the offering, giving, receiving or soliciting of anything of value likely to influence the action of a public official [or American Water Systems official] in the bidding process.

- 2. "Fraudulent practice" means a misrepresentation of facts made: (a) to influence the bidding or negotiating process to the detriment of Owner; (b) to establish bid prices at artificial non-competitive levels; or (c) to deprive Owner of the benefits of free and open competition.
- 3. "Collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
- 4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

5. <u>BASIS OF BID</u>

a. Bidder will complete the Work in accordance with the Contract Documents for the prices included in the Base Bid Price Schedule, and if selected in the order in which they appear, the alternate schedules (Schedules B, C, and D).

BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT CWSRF-4513 CONTRACT NUMBER 1

SCHEDULE A - BASE BID PRICE SCHEDULE

The following schedule shall be used to determine the amount of payment to the CONTRACTOR for actual work completed on this contract.

ITEM 1	FOR MOBILIZATION OF EQUIPMENT, MATERIALS AND LABOR		
	The Lump Sum Price of	\$(Extended Price)	
	(Write in Lump Sum Price for Item 1 in Words and Numb	ers)	
ITEM 2	FOR EXCAVATION AND DISPOSAL		
Item 2a	Additional price for rock excavation – All depths		
	100 Cu. Yd. @ \$ per Cu. Yd.	\$(Extended Price)	
	(Write in Unit Price for Item 2a in Words and Numbers)		
Item 2b	For Disposal of Contaminated Soil		
	100 Tons @ \$ per Ton.	\$(Extended Price)	
	(Write in Unit Price for Item 2b in Words and Numbers)		
Item 2c	For Disposal of Clean Unsuitable Soil		
	3,010 Tons @ \$ per Ton.	\$(Extended Price)	
	(Write in Unit Price for Item 2c in Words and Numbers)		
ITEM 3	FOR EXISTING UTILITY INVESTIGATIONS		
Item 3a	For Test Pits 760 Cu. Yd. @ \$ per Cu. Yd.	\$(Extended Price)	
	(Write in Unit Price for Item 3a in Words and Numbers)		

Item 3b	For Ground Penetrating Radar 17,270 Lin. Ft. @ \$ per Lin. Ft. \$ (Extended Price)
	(Write in Unit Price for Item 3b in Words and Numbers)
ITEM 4	FOR SITE CLEARING AND GRUBBING 0.3 Acre @ \$ per Ac. \$ (Extended Price)
	(Write in Unit Price for Item 4 in Words and Numbers)
ITEM 5	FOR SOIL EROSION AND SEDIMENT CONTROL
Item 5a	For Straw Wattles
	2,040 Lin. Ft. @ \$ per Lin. Ft. \$ (Extended Price)
	(Write in Unit Price for Item 5a in Words and Numbers)
Item 5b	For Inlet Protection
	110 Units @ \$ per Unit \$ (Extended Price) \$
	(Write in Unit Price for Item 5b in Words and Numbers)
ITEM 6	FOR FURNISHING, LAYING AND JOINTING SANITARY SEWER PIPE, INCLUDING PAVEMENT REMOVAL, EXCAVATION, BEDDING AND BACKFILL
Item 6a	For 8-inch Diameter SDR-35 PVC Pipe (From 0 to 9 Feet Depth)
	3,470 Lin. Ft. @ \$ per Lin. Ft. \$ (Extended Price)
	(Write in Unit Price for Item 6a in Words and Numbers)
Item 6b	For 8-inch Diameter SDR-35 PVC Pipe (Between 9 to 14 Feet Depth)
	2,990 Lin. Ft. @ \$ per Lin. Ft. \$ (Extended Price)
	(Write in Unit Price for Item 6b in Words and Numbers)

Item 6c	For 8-inch Diameter SDR-2 (For 0 to 9 Feet Depth)	26 PVC Pipe		
	1,470 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Iter	n 6d in Words and Numbers)		
Item 6d	For 8-inch Diameter SDR-2 (Between 14 to 18 Feet Dep	26 PVC Pipe pth)		
	470 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Iter	n 6f in Words and Numbers)		
Item 6e	For 8-inch Diameter SDR-2 (Greater than 18 Feet Depth	26 PVC Pipe n)		
	730 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Iter	m 6g in Words and Numbers)		
Item 6f	For 10-Inch Diameter SDR-35 PVC Pipe (From 0 to 9 Feet Depth)			
	2,710 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Iter	m 6h in Words and Numbers)		
Item 6g	For 10-Inch Diameter SDR (Between 9 to 14 Feet Dept	-35 PVC Pipe th)		
	1,370 Lin. Ft. @ \$	per Lin. Ft.	\$ (Extended Price)	
	(Write in Unit Price for Iter	n 6i in Words and Numbers)		
Item 6h	For 10-Inch Diameter SDR (Between 14 to 18 Feet Dep	-35 PVC Pipe pth)		
	880 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Iter	n 6j in Words and Numbers)		

Item 6i	For 10-Inch Diameter SDR-26 PVC Pipe (Between 9 to 14 Feet Depth)			
	350 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 61	in Words and Numbers)		
Item 6j	For 10-Inch Diameter SDR-26 (Between 14 to 18 Feet Depth)	PVC Pipe		
	300 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 6n	n in Words and Numbers)		
Item 6k	For 10-Inch Diameter C-900 PV (All Depths)	/C Pipe		
	315 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 6n	in Words and Numbers)		
Item 61	For 8-Inch Diameter C-900 PV (All Depths)	C Pipe		
	1,140 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 60	in Words and Numbers)		
Item 6m	For 2-inch Diameter SDR-21 P	VC Pipe (Low Pressure)		
	370 Lin. Ft. @ \$	per Lin. Ft	\$(Extended Price)	
	(Write in Unit Price for Item 6p	in Words and Numbers)		
ITEM 7	FOR SANITARY SERVICE L	ATERALS		
Item 7a	For 6-inch Diameter SDR- Assemblies	35 PVC Laterals inc	eluding Cleanout	
	4,810 Lin. Ft. @ \$	per Lin. Ft	\$(Extended Price)	
	(Write in Unit Price for Item 7a	in Words and Numbers)		

Item 7b	For Sewer Service Chimney		
	20 Units @ \$	per Unit	\$(Extended Price)
	(Write in Unit Price for Item 7b in Word	ls and Numbers)	
Item 7c	For 1-1/2-inch Diameter, SDR-21 PVC	Pipe (Pressure)	
	184 Lin. Ft. @ \$	_per Lin. Ft	\$(Extended Price)
	(Write in Unit Price for Item 7c in Word	ls and Numbers)	
ITEM 8	FOR RECONNECTING TO EXISTING	G SERVICE LATE	RALS
	7 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item 8 in Words	and Numbers)	
ITEM 9	FOR FURNISHING AND PLACING (INCLUDING FORMS)	G CONCRETE FO	OR PIPELINES
	15 Cu. Yd. @ \$	per Cu. Yd	\$(Extended Price)
	(Write in Unit Price for Item 9 in Words	and Numbers)	
ITEM 10	FOR REMOVAL AND DISPOSAL OF PIPE (All Depths and Sizes)	EXISTING SANI	TARY SEWER
	410 Lin. Ft. @ \$	per Lin. Ft	\$(Extended Price)
	(Write in Unit Price for Item 10 in Word	ls and Numbers)	
ITEM 11	FOR CONSTRUCTING NEW SANITA	ARY SEWER MAN	NHOLES
Item 11a	For Constructing New 48-inch Diameter (For Depths 0' to 9')	r Standard Manhole	es
	44 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item 11a in Wor	rds and Numbers)	

Item 11b	For Constructing New 48-inch Diame (For Depths Greater than 9' to 14')			
	30 Units @ \$	per Unit	\$ (Extended Price)	
	(Write in Unit Price for Item 11b in W	/ords and Numbers)		
Item 11c	For Constructing New 48-inch Diame (For Depths Greater than 14' to 18')	ter Standard Manholes		
	7 Units @ \$ per Unit		\$(Extended Price)	
	(Write in Unit Price for Item 11c in W	Vords and Numbers)		
Item 11d	For Constructing New 72-inch Diame (For Depths Greater than 18' to 22')	ter Standard Manholes		
	3 Units @ \$	_ per Unit	\$ (Extended Price)	
	(Write in Unit Price for Item 11d in W	/ords and Numbers)		
Item 11e	For Constructing New 48-inch Diameter Drop Manholes (For Depths Greater than 9' to 14')			
	1 Units @ \$	per Unit	\$ (Extended Price)	
	(Write in Unit Price for Item 11e in W	Vords and Numbers)		
Item 11f	For Constructing New 48-inch Diame (For Depths Greater than 14' to 18')	ter Drop Manholes		
	1 Units @ \$	per Unit	\$ (Extended Price)	
	(Write in Unit Price for Item 11f in W	ords and Numbers)		
Item 11g	For Constructing New 72-inch Drop N (For Depths Greater than 18' to 22')	Manholes		
	1 Units @ \$	per Unit	\$(Extended Price)	
	Write in Unit Price for Item 11g in W	/ords and Numbers)		

For Air Release/Cleanout Manholes on SDR-11 HDPE Force Main (All Depths)		
1 Units @ \$	per Unit	\$
<u> </u>	1	(Extended Price)
(Write in Unit Price for Item 11h in	Words and Numbers)	
For Cleanout Manholes on SDR-21 (All Depths)	PVC Low Pressure Sewer	
1 Units @ \$	_ per Unit	\$
		(Extended Price)
(Write in Unit Price for Item 11i in V	Words and Numbers)	
For Removing and Disposing Existi	ng Manholes (For All Dep	oths)
6 Units @ \$ per Unit		\$
		(Extended Price)
(Write in Unit Price for Item 11j in V	Words and Numbers)	
FOR FURNISHING, LAYING AN INCLUDING PAVEMENT REM AND BACKFILL	D JOINTING STORM SI OVAL, EXCAVATION	EWER PIPE, , BEDDING
For 12-inch Diameter Reinforced Co (All Depths)	oncrete Pipe	
90 Lin. Ft. @ \$	per Lin. Ft	\$ (Extended Price)
(Write in Unit Price for Item 12a in	Words and Numbers)	
For Removing and Disposing Reinfo (All Depths and Sizes)	orced Concrete Pipe	
90 Lin. Ft. @ \$	_ per Lin. Ft	\$ (Extended Price)
(Write in Unit Price for Item 12b in	Words and Numbers)	
FOR CONSTRUCTING NEW STO	ORM MANHOLES	
For Constructing New 48-inch Dian	neter Storm Manholes	
1 Units @ \$	per Unit	\$
	For Air Release/Cleanout Manholes (All Depths) 1 Units @ \$	For Air Release/Cleanout Manholes on SDR-11 HDPE Force (All Depths) 1 Units @ \$ per Unit (Write in Unit Price for Item 11h in Words and Numbers) For Cleanout Manholes on SDR-21 PVC Low Pressure Sewer (All Depths) 1 Units @ \$ per Unit (Write in Unit Price for Item 11i in Words and Numbers) For Removing and Disposing Existing Manholes (For All Depted Units @ \$ per Unit (Write in Unit Price for Item 11j in Words and Numbers) FOR FURNISHING, LAYING AND JOINTING STORM SI NCLUDING PAVEMENT REMOVAL, EXCAVATION, AND BACKFILL For 12-inch Diameter Reinforced Concrete Pipe (All Depths) 90 Lin. Ft. @ \$ per Lin. Ft (Write in Unit Price for Item 12a in Words and Numbers) For Removing and Disposing Reinforced Concrete Pipe (All Depths) 90 Lin. Ft. @ \$ per Lin. Ft (Write in Unit Price for Item 12b in Words and Numbers) FOR CONSTRUCTING NEW STORM MANHOLES For CONSTRUCTING NEW STORM MANHOLES 1 Units @ \$ per Unit

(Write in Unit Price for Item 13 in Words and Numbers)

ITEM 14	FOR CONSTRUCTING NEW STORM INLETS		
Item 14a	For Removing and Disposing of Existing Catch Basins or Storm Inlets (All Depths)		
	3 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item	14a in Words and Numbers)	
Item 14b	For Constructing new 48" C (All Depths)	atch Basin	
	3 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item	14b in Words and Numbers)	
ITEM 15 FOR FUNISHING AND PLACING BANK RUN SAND			
	2,040 Cu. Yd. @ \$	per Cu.Yd.	\$ (Extended Price)
	(Write in Unit Price for Item	1 15 in Words and Numbers)	
ITEM 16	FOR BITUMINOUS PAVE	EMENT	
Item 16a For Temporary Asphalt Pavement Replacement Trench Re Municipal Roads		ch Repairs in	
	16,330 Sq. Yd. @ \$	per Sq. Yd	\$(Extended Price)
	(Write in Unit Price for Item	16a in Words and Numbers)	
Item 16b	For Access Driveway Paver 340 Sq. Yd. @ \$	nent per Sq. Yd	\$(Extended Price)
	(Write in Unit Price for Item	16b in Words and Numbers)	

Item 16c	For Asphalt Pavement Sidewalk Replacement		
	50 Sq. Yd. @ \$ per Sq. Yd.	\$(Extended Price)	
	(Write in Unit Price for Item 16c in Words and Numbers)		
Item 16d	For Asphalt Pavement Curb Replacement		
	690 Lin. Ft. @ \$ per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 16d in Words and Numbers)		
Item 16e	For Traffic Striping		
	5,000 Lin. Ft. @ \$ per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 16e in Words and Numbers)		
ITEM 17	FOR CONCRETE SIDEWALK		
	80 Sq. Yd. @ \$ per Sq. Yd.	\$(Extended Price)	
	(Write in Unit Price for Item 17 in Words and Numbers)		
ITEM 18	FOR LANDSCAPING REPLACEMENT		
Item 18a	For Restoration of Unpaved Areas		
	1,090 Sq. Yd. @ \$ per Sq. Yd.	\$(Extended Price)	
	(Write in Unit Price for Item 18a in Words and Numbers)		
Item 18b	For Replacement of Landscape Shrub		
	2 Units @ \$ per Unit	\$(Extended Price)	
	(Write in Unit Price for Item 18b in Words and Numbers)		
Item 18c	For Replacement of Landscape Tree		

	3 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item 18c in Wo	ords and Numbers)	
ITEM 19	FOR DUCTILE IRON WATER MAIN	N	
Item 19a	For 6-inch Diameter Ductile Iron Wate	r Main	
	150 Lin. Ft. @ \$ per Lin. Ft.		\$(Extended Price)
	(Write in Unit Price for Item 19a in Wo	ords and Numbers)	
ITEM 20	FOR FURNISHING AND INSTALLI	NG FIRE HYDRANTS	3
	1 Units @ \$]	per Unit	\$(Extended Price)
	(Write in Unit Price for Item 20 in Wor	rds and Numbers)	
ITEM 21	FOR THE PIPER/APRICOT PUMP S	TATION COMPLETE	AND OPERATIONAL
	The Lump Sum Price of		\$(Extended Price)
	(Write in Lump Sum Price for Item 21	in Words and Numbers))
ITEM 22	FOR THE VALLEY VIEW CI OPERATIONAL	RCLE PUMP STA	TION COMPLETE AND
	The Lump Sum Price of		\$(Extended Price)
	(Write in Lump Sum Price for Item 22	in Words and Numbers	.)
ITEM 23	FOR FURNISHING AND INSTALI MAIN INCLUDING LAYING, JOIN TESTING AND RESTRAINT (All D	LING 3-INCH SDR-1 FING, FITTINGS, VA epths)	1 HDPE SEWAGE FORCE LVING, STONE BEDDING,
	2,300 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)
	(Write in Unit Price for Item 23 in Wor	rds and Numbers)	

ITEM 24	FOR FURNISHING AND CONSTRUCTING GUARD RAIL		
Item 24a	For Furnishing and Constructing Guard Rail		
	100 Lin. Ft. @ \$ per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 24a in Words and Numbers)		
Item 24b	For Removal and Disposal of Existing Guard Rail		
	130 Lin. Ft. @ \$ per Lin. Ft.	\$(Extended Price)	
	(Write in Unit Price for Item 24b in Words and Numbers)		
ITEM 25	FOR EXCAVATABLE FLOWABLE FILL (CDF)		
	660 Cu. Yd. @ \$ per Cu. Yd.	\$(Extended Price)	
	(Write in Unit Price for Item 25 in Words and Numbers)		
ITEM 26	FOR TRAFFIC CONTROL AND SIGNAGE		
	The Lump Sum Price of	\$ (Extended Price)	
	(Write in Lump Sum Price for Item 26 in Words and Number	ers)	
ITEM 27	MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASP MIXTURES	HALT (HMA)	
	Allowance of	\$2,000.00	
	Two thousand dollars and no cents (Write Allowance Price in Words and Numbers)		
ITEM 28	MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL		
	Allowance of	\$2,000.00	
	Two thousand dollars and no cents (Write Allowance Price in Words and Numbers)		

ITEM 29 MONTHLY PRICE ADJUSTMENT FOR GASOLINE FUEL

Allowance of

\$ 2,000.00

Two thousand dollars and no cents (Write Allowance Price in Words and Numbers)

ITEM 30 MONTHLY PRICE ADJUSTMENT PORTLAND CEMENT IN CONCRTE

Allowance of

\$_____2,000.00

Two thousand dollars and no cents (Write Allowance Price)

TOTAL FOR SCHEDULE A - BASE BID

(Items 1 through 30, Inclusive)

\$_____

(WRITE TOTAL BASE BID IN WORDS AND NUMBERS)

SCHEDULE B – ALTERNATE #1 PRICE SCHEDULE (PIPER ROAD - C112A & C112B)

ITEM 1	FOR MOBILIZATION OF EQUIPMENT, MATERIALS AND LABOR		
	The Lump Sum Price of	:	§ (Extended Price)
	(Write in Lump Sum Price for Item 1 in Wor	ds and Numbers)	
ITEM 2	FOR EXCAVATION AND DISPOSAL		
Item 2c	m 2c For Disposal of Clean Unsuitable Soil		
	140 Tons @ \$ per Tor	1.	\$(Extended Price)
	(Write in Unit Price for Item 2c in Words and	1 Numbers)	
ITEM 3	FOR EXISTING UTILITY INVESTIGATIO	ONS	
Item 3a	For Test Pits 30 Cu. Yd. @ \$ per Cu.	Yd.	\$(Extended Price)
	(Write in Unit Price for Item 3a in Words and Numbers)		

Item 3b	For Ground Penetrating Radar 980 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)
	(Write in Unit Price for Item 3b i	n Words and Numbers)	
ITEM 5	FOR SOIL EROSION AND SEE	DIMENT CONTROL	
Item 5b	For Inlet Protection		
	10 Units @ \$	per Unit	\$(Extended Price)
	(Write in Unit Price for Item 5b i	n Words and Numbers)	
ITEM 6	FOR FURNISHING, LAYING PIPE, INCLUDING PAVEN BEDDING AND BACKFILL	AND JOINTING SAN IENT REMOVAL,	ITARY SEWER EXCAVATION,
Item 6m	For 2-inch Diameter SDR-21 PV	C Pipe (Low Pressure)	
	980 Lin. Ft. @ \$	per Lin. Ft	\$(Extended Price)
	(Write in Unit Price for Item 6m	in Words and Numbers)	
ITEM 7	FOR SANITARY SERVICE LA	TERALS	
Item 7c	For 1-1/2-inch Diameter, SDR-21	PVC Pipe (Pressure)	
	290 Lin. Ft. @ \$	per Lin. Ft	\$(Extended Price)
	(Write in Unit Price for Item 7c in	n Words and Numbers)	
ITEM 11	FOR CONSTRUCTING NEW S	SANITARY SEWER MA	ANHOLES
Item 11a	For Constructing New 48-inch D (For Depths 0' to 9')	iameter Standard Manho	bles
	1 Units @ \$	per Unit	\$(Extended Price)
	(Write in Unit Price for Item 11a	in Words and Numbers)	

Item 11i	For Cleanout Manholes on SDR-2 (All Depths)	1 PVC Low Pressure Sew	er
	6 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item 11i i	n Words and Numbers)	
Item 11j	For Removing and Disposing Ext	isting Manholes (For All I	Depths)
	1 Units @ \$	per Unit	\$(Extended Price)
	(Write in Unit Price for Item 11j i	n Words and Numbers)	
ITEM 15	FOR FUNISHING AND PLACIN	NG BANK RUN SAND	
	100 Cu. Yd. @ \$	per Cu.Yd.	\$(Extended Price)
	(Write in Unit Price for Item 15 in	Words and Numbers)	
ITEM 16	FOR BITUMINOUS PAVEMEN	Т	
ITEM 16a	For Temporary Asphalt Pavement R Roads	Replacement Trench Repai	rs in Municipal
	660 Sq. Yd. @ \$	per Sq. Yd	\$(Extended Price)
	(Write in Unit Price for Item 16a)	n Words and Numbers)	
Item 16b	For Access Driveway Pavement 30 Sq. Yd. @ \$	per Sq. Yd	\$ (Extended Price)
	(Write in Unit Price for Item 16b	in Words and Numbers)	
Item 16d	For Asphalt Pavement Curb Repla	acement	
	60 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)
	(Write in Unit Price for Item 16d	in Words and Numbers)	

Item 16e	For Traffic Striping		
	1,000 Lin. Ft. @ \$ per Lin. Ft.	\$(I	Extended Price)
	(Write in Unit Price for Item 16e in Words and Numbers)		
ITEM 18	FOR LANDSCAPING REPLACEMENT		
Item 18a	For Restoration of Unpaved Areas		
	60 Sq. Yd. @ \$ per Sq. Yd.	\$(I	Extended Price)
	(Write in Unit Price for Item 18a in Words and Numbers)		
ITEM 26	FOR TRAFFIC CONTROL AND SIGNAGE		
	The Lump Sum Price of	\$(Ext	ended Price)
	(Write in Lump Sum Price for Item 26 in Words and Number	rs)	
ITEM 27	MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPE MIXTURES	IALT (HMA)
	Allowance of	\$ <u> </u>	500.00
	Five hundred dollars and no cents (Write Allowance Price in Words and Numbers)		
ITEM 28	MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL		
	Allowance of	\$ <u> </u>	500.00
	<u>Five hundred dollars and no cents</u> (Write Allowance Price in Words and Numbers)		
ITEM 29	MONTHLY PRICE ADJUSTMENT FOR GASOLINE FUE	L	
	Allowance of	\$ <u> </u>	500.00
	Five hundred dollars and no cents (Write Allowance Price in Words and Numbers)		

ITEM 30 MONTHLY PRICE ADJUSTMENT PORTLAND CEMENT IN CONCRTE

Allowance of

\$ 500.00

Five hundred dollars and no cents (Write Allowance Price)

TOTAL FOR SCHEDULE B - ALTERNATE #1 (PIPER ROAD C112A & C112B)

Φ

(WRITE TOTAL BASE BID IN WORDS AND NUMBERS)

SCHEDULE C – ALTERNATE #2 PRICE SCHEDULE (CYNTHIA DRIVE - C130)

ITEM 1 FOR MOBILIZATION OF EQUIPMENT, MATERIALS AND LABOR

The Lump Sum	Price of
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Extended Price)

(Write in Lump Sum Price for Item 1 in Words and Numbers)

ITEM 3 FOR EXISTING UTILITY INVESTIGATIONS

Item 3a For Test Pits 30 Cu. Yd. @ \$_____ per Cu. Yd. \$_____

(Extended Price)

(Write in Unit Price for Item 3a in Words and Numbers)

Item 3bFor Ground Penetrating Radar540 Lin. Ft. @ \$_____ per Lin. Ft.

(Extended Price)

(Write in Unit Price for Item 3b in Words and Numbers)

ITEM 6 FOR FURNISHING, LAYING AND JOINTING SANITARY SEWER PIPE, INCLUDING PAVEMENT REMOVAL, EXCAVATION, BEDDING AND BACKFILL

Item 6a For 8-inch Diameter SDR-35 PVC Pipe (From 0 to 9 Feet Depth)

540 Lin. Ft. @ \$_____ per Lin. Ft.

(Extended Price)

(Write in Unit Price for Item 6a in Words and Numbers)

ITEM 7	FOR SANITARY SERVICE LATERALS	
Item 7a	For 6-inch Diameter SDR-35 PVC Laterals including Cleance	out Assemblies
	200 Lin. Ft. @ \$ per Lin. Ft	\$(Extended Price)
	(Write in Unit Price for Item 7a in Words and Numbers)	
ITEM 11	FOR CONSTRUCTING NEW SANITARY SEWER MAN	IHOLES
Item 11a	For Constructing New 48-inch Diameter Standard Manholes (For Depths 0' to 9')	3
	4 Units @ \$ per Unit	\$(Extended Price)
	(Write in Unit Price for Item 11a in Words and Numbers)	
ITEM 16	FOR BITUMINOUS PAVEMENT	
ITEM 16a	For Temporary Asphalt Pavement Replacement Trench Repair Roads	rs in Municipal
	500 Sq. Yd. @ \$ per Sq. Yd	\$(Extended Price)
	(Write in Unit Price for Item 16a in Words and Numbers)	
Item 16b	For Access Driveway Pavement 30 Sq. Yd. @ \$ per Sq. Yd	\$ (Extended Price)
	(Write in Unit Price for Item 16b in Words and Numbers)	
Item 16d	For Asphalt Pavement Curb Replacement	
	50 Lin. Ft. @ \$ per Lin. Ft.	<pre>\$</pre> (Extended Price)
	(Write in Unit Price for Item 16d in Words and Numbers)	
ITEM 18	FOR LANDSCAPING REPLACEMENT	
Item 18a	For Restoration of Unpaved Areas	

	50 Sq. Yd. @ \$ per Sq. Yd.	\$(Extended Price)
	(Write in Unit Price for Item 18a in Words and Numbers)	
ITEM 25	FOR EXCAVATABLE FLOWABLE FILL (CDF)	
	30 Cu. Yd. @ \$ per Cu. Yd.	\$(Extended Price)
	(Write in Unit Price for Item 25 in Words and Numbers)	
ITEM 26	FOR TRAFFIC CONTROL AND SIGNAGE	
	The Lump Sum Price of	\$ (Extended Price)
	(Write in Lump Sum Price for Item 26 in Words and Numb	ers)
ITEM 27	MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASP MIXTURES	PHALT (HMA)
	Allowance of	\$ <u>500.00</u>
	Five hundred dollars and no cents (Write Allowance Price in Words and Numbers)	
ITEM 28	MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL	
	Allowance of	\$ <u>500.00</u>
	Five hundred dollars and no cents (Write Allowance Price in Words and Numbers)	
ITEM 29	MONTHLY PRICE ADJUSTMENT FOR GASOLINE FU	EL
	Allowance of	\$ <u>500.00</u>
	Five hundred dollars and no cents (Write Allowance Price in Words and Numbers)	
ITEM 30 N	IONTHLY PRICE ADJUSTMENT PORTLAND CEMENT	IN CONCRTE
	Allowance of	\$ <u>500.00</u>
	Five hundred dollars and no cents	
507400(2(00)	00410.22	

(Write Allowance Price)

TOTAL FOR SCHEDULE C - ALTERNATE #2 (CYNTHIA DRIVE – C130)

\$_____

(WRITE TOTAL BASE BID IN WORDS AND NUMBERS)

SCHEDULE D – ALTERNATE #3 PRICE SCHEDULE (APRICOT HILL LANE AREA – C113 & C114)

ITEM 1 FOR MOBILIZATION OF EQUIPMENT, MATERIALS AND LABOR

The Lump Sum Price of

\$_____(Extended Price)

(Extended Price)

(Write in Lump Sum Price for Item 1 in Words and Numbers)

- ITEM 2 FOR EXCAVATION AND DISPOSAL
- Item 2c For Disposal of Clean Unsuitable Soil

 350 Tons @ \$______ per Ton.
 \$_______

 (Extended Price)
 \$_______

(Write in Unit Price for Item 2c in Words and Numbers)

- ITEM 3 FOR EXISTING UTILITY INVESTIGATIONS
- Item 3a For Test Pits 10 Cu. Yd. @ \$_____per Cu. Yd. \$______(Extended Price)

(Write in Unit Price for Item 3a in Words and Numbers)

Item 3bFor Ground Penetrating Radar510 Lin. Ft. @ \$_____ per Lin. Ft.

(Write in Unit Price for Item 3b in Words and Numbers)

ITEM 4 FOR SITE CLEARING AND GRUBBING 0.2 Acre @ \$_____ per Ac. \$_____ (Extended Price)

(Write in Unit Price for Item 4 in Words and Numbers)

ITEM 5	FOR SOIL EROSION AND SE	DIMENT CONTROL	
Item 5b	For Inlet Protection		
	10 Units @ \$	per Unit	\$(Extended Price)
	(Write in Unit Price for Item 5b	in Words and Numbers)	
ITEM 6	FOR FURNISHING, LAYING PIPE, INCLUDING PAVE BEDDING AND BACKFILL	G AND JOINTING SAN MENT REMOVAL,	NITARY SEWER EXCAVATION,
Item 6a	For 8-inch Diameter SDR-35 PV (From 0 to 9 Feet Depth)	/C Pipe	
	860 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)
	(Write in Unit Price for Item 6a	in Words and Numbers)	
Item 6b	For 8-inch Diameter SDR-35 PV (Between 9 to 14 Feet Depth)	/C Pipe	
	320 Lin. Ft. @ \$	per Lin. Ft.	\$ (Extended Price)
	(Write in Unit Price for Item 6b	in Words and Numbers)	
ITEM 7	FOR SANITARY SERVICE LA	ATERALS	
Item 7a	For 6-inch Diameter SDR-35 PVC Laterals including Cleanout Assemblies		
	200 Lin. Ft. @ \$	per Lin. Ft	\$(Extended Price)
	(Write in Unit Price for Item 7a	in Words and Numbers)	
ITEM 11	FOR CONSTRUCTING NEW	SANITARY SEWER M	ANHOLES
Item 11a	For Constructing New 48-inch I (For Depths 0' to 9')	Diameter Standard Manho	bles
	4 Units @ \$	per Unit	\$ (Extended Price)
	(Write in Unit Price for Item 11a	a in Words and Numbers)	-)

Item 11b	For Constructing New 48-inch Diameter Standard Manholes (For Depths Greater than 9' to 14')		
	1 Units @ \$	_ per Unit	\$
			(Extended Price)
	(Write in Unit Price for Item 11b in Wo	ords and Numbers)	
ITEM 15	FOR FUNISHING AND PLACING BA	ANK RUN SAND	
	240 Cu. Yd. @ \$]	per Cu.Yd.	<pre>\$(Extended Price)</pre>
	(Write in Unit Price for Item 15 in Word	ds and Numbers)	
ITEM 16	FOR BITUMINOUS PAVEMENT		
ITEM 16a	For Temporary Asphalt Pavement Replac Roads	ement Trench Repair	s in Municipal
	920 Sq. Yd. @ \$	per Sq. Yd	\$ (Extended Price)
	(Write in Unit Price for Item 16a in Wo	rds and Numbers)	
Item 16b	For Access Driveway Pavement 30 Sq. Yd. @ \$p	er Sq. Yd	\$(Extended Price)
	(Write in Unit Price for Item 16b in Wo	ords and Numbers)	
Item 16c	For Asphalt Pavement Sidewalk Replace	ement	
	10 Sq. Yd. @ \$	_ per Sq. Yd.	\$(Extended Price)
	(Write in Unit Price for Item 16c in Wo	rds and Numbers)	
Item 16d	For Asphalt Pavement Curb Replaceme	ent	
	30 Lin. Ft. @ \$	per Lin. Ft.	\$(Extended Price)
	(Write in Unit Price for Item 16d in Wo	ords and Numbers)	
ITEM 18	FOR LANDSCAPING REPLACEMEN	NT	

Item 18a	For Restoration of Unpaved Areas	
	1,040 Sq. Yd. @ \$ per Sq. Yd.	\$(Extended Price)
	(Write in Unit Price for Item 18a in Words and Numbers)	
Item 18c	For Replacement of Landscape Tree	
	2 Units @ \$ per Unit	\$ (Extended Price)
	(Write in Unit Price for Item 18c in Words and Numbers)	
ITEM 19	FOR DUCTILE IRON WATER MAIN	
Item 19b	For 8-inch Diameter Ductile Iron Water Main	
	40 Lin. Ft. @ \$ per Lin. Ft.	\$(Extended Price)
	(Write in Unit Price for Item 19b in Words and Numbers)	
ITEM 25	FOR EXCAVATABLE FLOWABLE FILL (CDF)	
	20 Cu. Yd. @ \$ per Cu. Yd.	\$(Extended Price)
	(Write in Unit Price for Item 25 in Words and Numbers)	
ITEM 26	FOR TRAFFIC CONTROL AND SIGNAGE	
	The Lump Sum Price of	\$ (Extended Price)
	(Write in Lump Sum Price for Item 26 in Words and Number	ers)
ITEM 27	MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASP MIXTURES	HALT (HMA)
	Allowance of	\$ <u>500.00</u>
	Five hundred dollars and no cents (Write Allowance Price in Words and Numbers)	

ITEM 28	MONTHLY PRICE ADJUSTMENT FOR DIESEL FU	JEL	
	Allowance of	\$ <u>500.00</u>	
	<u>Five hundred dollars and no cents</u> (Write Allowance Price in Words and Numbers)		
ITEM 29	MONTHLY PRICE ADJUSTMENT FOR GASOLIN	E FUEL	
	Allowance of	\$ <u>500.00</u>	
	<u>Five hundred dollars and no cents</u> (Write Allowance Price in Words and Numbers)		
ITEM 30	MONTHLY PRICE ADJUSTMENT PORTLAND CEM	ENT IN CONCRTE	
	Allowance of	\$500.00	
	Five hundred dollars and no cents (Write Allowance Price)		
TOTAL FO	OR SCHEDULE D - ALTERNATE #3 (APRICOT HILI	L LANE AREA – C113 & C114	Ð
		\$	
(WRITE TO	OTAL BASE BID IN WORDS AND NUMBERS)		
TOTAL A	MOUNT OF BASE BID AND ALTERNATE #1 (SCHE	DULES A AND B)	
		\$	
(WRITE TO	OTAL BASE BID IN WORDS AND NUMBERS)		
TOTAL A	MOUNT OF BASE BID, ALTERNATE #1, AND ALT	ERNATE #2 (SCHEDULES A	ь, В,
AND C)		\$	
(WRITE TO	OTAL BASE BID IN WORDS AND NUMBERS)		

TOTAL AMOUNT OF BASE BID, ALTERNATE #1, ALTERNATE #2, AND ALTERNATE #3 (SCHEDULES A, B, C, AND D)

\$_____

(WRITE TOTAL BASE BID IN WORDS AND NUMBERS)

6. <u>TIME OF COMPLETION</u>

The Contractor shall achieve final completion on the work performed under the contract(s) and the project will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within the time limits indicated in Item 3 of the Agreement.

Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

7. <u>ATTACHMENTS TO THIS BID</u>

The following documents are submitted with and made a condition of this Bid:

- a. Bid deposit in the amount of ______dollars (\$_____), consisting of a bid bond in the amount of five percent of the total amount of Bid
- b. Evidence of authority to sign
- c. Schedule of DBE participation (Form EEO-DEP-190C)
- d. DBE Letters of Intent (Form EEO-DEP-191C)
- e. DBE Certification of United States Citizenship Form
- f. DBE Subcontractor Participation Form (EPA Form 6100-2)
- g. Request for Waiver (EEO-DEP-490C)
- h. Evidence of authority to do business in the state of the Project, or a written covenant to obtain such license within the time for acceptance of Bids;
- i. A list of adversarial proceedings in which the bidder is or was a party within the past 5 years that relate to the procurement or performance of any public or private construction contract together with a brief statement as to outcome if concluded or status if pending.
- j. A list of any projects on which the firm was terminated or failed to complete the work within the past 5 years, including a brief explanation for each instance listed.
- k. Evidence of Bidder's qualifications in accordance with Item 3 of Section 00200
- 1. Certificate as to Corporate Bidder
- m. Contractor's Certification
- n. Department of Environmental Protection's Diesel Retrofit Program Statement of Intent to Comply and Contractor Certification
- o. Prevailing Wage Certification

p. Tax Certification Statement

8. <u>DEFINED TERMS</u>

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

9. <u>BII</u>	D SUBMITTAL	
This Bid is	submitted on,	2020 by:
If Bidder is:	:	
An Individu	ual	
Na	me (typed or printed):	
Bv	:	
5	(Individual's signature)	
Do	ing business as:	
Bus	siness Address:	
Pho	one No.:	E-mail:
Sta	te Contractor License No. (If applicable)	
A Partnersh	nip	
Par	tnership Name:	
By	:	
5	(Signature of general partner atta	ch evidence of authority to sign)
Nai	me (typed or printed):	
Bus	siness Address:	
Pho	one No.:	_E-mail:
Sta	te Contractor License No. (If applicable):	

A Corporation

Corporation Name:
(SEAL)
State of Incorporation:
Type (General Business, Professional, Service, Limited Liability):
By:
(Signature attach evidence of authority to sign)
Name (typed or printed):
Title:
(CORPORATE SEAL)
Attest:
Business Address:
Phone No.:E-mail:
State Contractor License No. (If applicable):
Date of Qualification to do business inis/
[State where Project is located]

507408636-002 February 2020

A Joint Venture

Name of Joint Venture:	
First Joint Venturer Name:	
By:	
(Signature of first joint venture partner atta	ich evidence of authority to sign)
Name (typed or printed):	
Title:	
Second Joint Venturer Name:	(SEAL)
By:	
(Signature of second joint venture partner c	attach evidence of authority to sign)
Name (typed or printed):	
Title:	
Business Address:	
Phone No.:E-mail:	
State Contractor License No. (If applicable):	

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

END OF SECTION

ATTACHMENT A

Bid Deposit (Provided by Bidder)

ATTACHMENT B

Evidence of Authority to Sign (Provided by Bidder)

ATTACHMENT C

Schedule of DBE Participation (Form EEO-DEP-190C)
DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF MUNICIPAL SERVICES

SCHEDULE OF PARTICIPATION FOR SRF CONSTRUCTION

Project Title:

Project Location:

Disadvantaged Minority Business Enterprise Participation in the SRF Loan Work

		Dollar Value of
Name & Address of D/MBE	Nature of Participation	Participation
1.		
2.		
3.		
	\$	
Percentage D/MBE Participation = (Total D/MBE C	%	

Disadvantaged Women Business Enterprise Participation in the SRF Loan Work

		Dollar Value of
Name & Address of D/WBE	Nature of Participation	Participation
1.		
2.		
3.		
	Total D/WBE Commitment:	\$
Percentage D/WBE Participation = (Total D/WBE C	%	

The Bidder agrees to furnish implementation reports as required by MassDEP to indicate the D/MBEs and D/WBE(s) which it has used or intends to use. Breach of this commitment constitutes a breach of the contract.

Name of Bidder:

Date: _____ By: _____ Signature

NOTE: Participation of a DBE may be counted in only their certified category; the same dollar participation cannot be used in computing the percentage of D/MBE participation and again of D/WBE participation.

EEO-DEP-190C

EEO-DEP-E Page 10 of 16

ATTACHMENT D

DBE Letters of Intent (Form EEO-DEP-191C)

LETTER OF INTENT FOR SRF CONSTRUCTION

This form is to be completed by the D/MBE and D/WBE and must be submitted by the Bidder no later			
than close of business on the third business day after notification by the LGU. A separate form must be			
completed for each D/MBE and D/WBE involved in the project.			
Project Title: Project Location:			
то:			
(Name of Bidder)			
FROM:			
(Please Indicate Status []D/MBE or []D/WBE)			
^o I/we intend to perform work in connection with the above project as (check one):			
[] An individual	[] A partnership		
[] A corporation	[] A joint venture with:		

^o It is understood that if you are awarded the contract, you intend to enter into an agreement to perform the activity described below for the prices indicated.

DBE PARTICIPATION

	Date of Project		%
Description of Activity	Commencement	\$ Amount	Bid Price
		\$	%

° The undersigned certify that they will enter into a formal agreement upon execution of the contract for the above referenced project.

BIDDER	DBE
(Authorized Original Signature) Date	(Authorized Original Signature) Date
ADDRESS:	ADDRESS:
TELEPHONE #:	TELEPHONE #:
FEIN:	FEIN:
EMAIL ADDRESS:	EMAIL ADDRESS:

ORIGINALS:

- ^o Compliance Mgr. City/Town Project Location
 ^o DEP Program Manager for DEP's AAO Director

* Attach a copy of current (within 2 years) DBE Certification

EEO	-D]	EP-	19	1C
	-			- C

EEO-DEP-E Page 11 of 16

ATTACHMENT E

DBE Certification of United States Citizenship Form

DBE CERTIFICATION OF UNITED STATES CITIZENSHIP

For the SRF program, under the EPA Disadvantage Business Enterprise (DBE) Rule, a DBE must be owned or controlled by a socially and economically disadvantaged person that is also a **citizen of the United States** (*See* 40 CFR 33.202). "Ownership" is defined at 13 CFR 124.105 and "control" is defined at 13 CFR 124.106.

DBEs are certified for the SRF program through the Supplier Diversity Office using the federal Department of Transportation (DOT) DBE rules. EPA allows the use of DBEs certified under the DOT rules as long as they are also United States citizens. To ensure compliance with the EPA rule, MassDEP must verify United States citizenship through the completion of the following form for each DBE used on the project.

SRF Project Number

Contract Number

Contract Title

DBE Subcontractor

The undersigned, on behalf of the above named DBE subcontractor, hereby certifies that the DBE firm is either owned or controlled by a person or persons that are citizens of the United States.

Printed Name and Title of DBE Signatory

DBE Signature

Date

EEO-DEP-E Page 12 of 16

ATTACHMENT F

DBE Subcontractor Participation Form (EPA Form 6100-2)

DISADVANTAGED BUSINESS ENTERPRISE PROGRAM DBE SUBCONTRACTOR PARTICIPATION FORM

The United States Environmental Protection Agency (EPA) requires that this form be provided to all subcontractors on the project. At the option of the subcontractor, this form may be filled out and submitted directly to the EPA DBE Coordinator.

NAME OF SUBCONTRACTOR	PROJECT NAME
ADDRESS	CONTRACT NO.
TELEPHONE NO.	E-MAIL ADDRESS
PRIME CONTRACTOR NAME:	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR
Subcontractor	Signature Title/Date	

Equivalent to EPA form 6100-2

EEO-DEP-E Page 13 of 16

ATTACHMENT G

Request for Waiver (EEO-DEP-490C)

REQUEST FOR WAIVER FOR SRF CONSTRUCTION

Upon exhausting all known sources and making every possible effort to meet the minimum requirements for DBE participation, the Bidder may seek relief either partially or entirely from these requirements by submitting a completed waiver package by the close of business on the third business day after notification by the LGU. Failure to comply with this process shall be cause to reject the bid thereby rendering the Bidder not eligible for award of the contract.

General Information

Project Title:		Project Location:	
Bid Opening (time/date)			
Bidder:			
Mailing Address:			
Contact Person:	Telepho	ne No. <u>()</u>	Ext.

Minimum Requirements

The bidder must demonstrate that good faith efforts were undertaken to comply with the percentage goals as specified. The firm seeking relief must show that such efforts were taken appropriately in advance of the time set for opening bid proposals to allow adequate time for response(s) by submitting the following:

- A. A detailed record of the effort made to contact and negotiate with disadvantaged minority and/or woman owned businesses, including:
 - 1. names, addresses, telephone numbers and contact dates of all such companies contacted;
 - 2. copies of written notice(s) which were sent to DBE potential subcontractors prior to bid opening;
 - 3. a detailed statement as to why each subcontractor contacted (i) was not willing to do the job or (ii) was not qualified to perform the work as solicited; and
 - 4. in the case(s) where a negotiated price could not be reached the bidder should detail what efforts were made to reach an agreement on a competitive price.
 - 5. copies of advertisements, dated not less than ten (10) days prior to bid opening, as appearing in general publications, trade-oriented publications, and applicable minority/women-focused media detailing the opportunities for participation;

EEO-DEP-490C Page 1 of 2

EEO-DEP-E Page 14 of 16

- B. MassDEP may require the bidder to produce such additional information as it deems appropriate.
- C. No later than fifteen (15) days after submission of all required information and documentation, MassDEP shall make a determination, in writing, whether the waiver request is granted and shall provide that determination to the bidder and Awarding Authority. If the waiver request is denied, the facts upon which a denial is based will be set forth in writing.

CERTIFICATION

The undersigned herewith certifies that the above information and appropriate attachments are true and accurate to the best of my knowledge and that I have been authorized to act on behalf of the bidder in this matter.

(authorized original signature)

DATE

EEO-DEP-490C Page 2 of 2

EEO-DEP-E Page 15 of 16

ATTACHMENT H

Evidence of Authority to Do Business in Massachusetts (Provided by Bidder)

ATTACHMENT I

List of Adversarial Proceedings (Provided by Bidder)

ATTACHMENT J

List of Project Terminations (Provided by Bidder)

ATTACHMENT K

Evidence of Bidder's Qualifications (Provided by Bidder)

ATTACHMENT L

Certificate as to Corporate Bidder

CERTIFICATE AS TO CORPORATE BIDDER

I,	certify that I am the	of the
corporation named as bidde	within this bid form; that	,
who signed said bid form or	behalf of the bidder was then	of
said corporation; that I know	v his signature; that his signature thereto is ge	nuine and that such bid
form was duly signed, seale	d and executed for and in behalf of said corpo	pration by authority of its
governing body.		

_

(Corporate Seal)

Dated:_____

Secretary - Clerk

ATTACHMENT M

Contractor's Certification

APPENDIX A1

Certification Statements wording required in the BID PROPOSAL of contracts <u>bid under</u> the provisions of c.30, s39M (Non-Building/Public Works Contract).				
	Pursuant to M.G.L. Ch. 62C, s49A, 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.			
C.30 s39 (c)	The undersigned hereby certifies 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.			
	The undersigned bidder hereby certifies he/she will comply with the specific affirmative action steps contained in the Equal Employment Opportunity/Affirmative Action (EEO/AA) provisions of this Contract, including compliance with the Disadvantaged Business Enterprise provisions as required under these contract provisions. The contractor receiving the award of the contract shall incorporate the EEO/AA provisions of this contract into all subcontracts and purchase orders so that such provisions will be binding upon each subcontractor or vendor.			
C.30 s39 (a)	The undersigned certifies under penalties of perjury that this bid is in all respects bonafide, fair and made without collusion or fraud with any other person. As use in this paragraph the "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.			
Certification undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of Section Twenty-Nine F of Chapter Twenty- Nine, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulations promulgated thereunder; and is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.				
(Date)	(Name of General Bidder) (Federal Employer Identification No.)			
	Bv:			
	(Signature)			
	(Title & Name of person signing bid)			
	(Business Address)			

(City, State, Zip)

DEP-DMS-A1 Page 1 of 1

ATTACHMENT N

Department of Environmental Protection's Diesel Retrofit Program Statement of Intent to Comply & Contractor Certification

APPENDIX B (cont.) DIESEL RETROFIT PROGRAM

STATEMENT OF INTENT TO COMPLY

This form must be signed and submitted by the bidder as part of the bid.

Local Governmental Unit		SRF Project No.
Contract No.	Contact Title	
Bidder		

The undersigned, on behalf of the above-named Bidder, agrees that, if awarded the Contract:

- 1. the Bidder shall comply with the Department of Environmental Protection's ("DEP") Diesel Retrofit Program by ensuring that all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract are equipped or retrofitted with a pollution control device in accordance with the Diesel Retrofit Program Standard;
- 2. the Bidder shall require all Subcontractors to comply with DEP's Diesel Retrofit Program by ensuring all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract are equipped or retrofitted with a pollution control device in accordance with the Diesel Retrofit Program Standard; and
- 3. The Bidder shall submit and shall require each Subcontractor to submit a Diesel Retrofit Program Contractor Certification (form attached) with a Diesel Retrofit List to DEP (NAME and ADDRESS) and the Bidder within 10 days of the bidder being notified that it has been awarded the Contract. The Bidder shall require each Subcontractor to update such Certification and List within 2 days of using additional Diesel Construction Equipment on the project under the Contract.

(Signature of Bidder's Authorized Representative)

(Date)

DEP-DMS-B Page 4 of 6

APPENDIX B (cont.) DIESEL RETROFIT PROGRAM CONTRACTOR CERTIFICATION

Each Contractor and its Subcontractor(s) must sign and submit this form to DEP DMS project engineer, 5 th Floor, MassDEP, One Winter Street, Boston, MA 02108 and the Municipality within 10 days after the Contractor is notified that it is awarded the Contract.					
Local (Governmental Unit	SRF Project No.			
Contra	ct No.	Contact Title			
Contra	ctor				
I.		an authorized signatory for			
hereby of 50 brak "Diesel particul accorda	certify that any and all e horsepower which v Construction Equipm ate filters, installed on nce with the Diesel R	I diesel powered non-road construction equipment and vehicles greater than vill be used in the performance of the work under the Contract (hereinafter nent") have pollution control devices, such as oxidation catalysts or in the exhaust system side of the diesel combustion engine equipment in the terofit Program Standard.			
I am sul Equipm List is c each pie	omitting on behalf of ent, labeled "Diesel F orrect and accurate as ece of Diesel Constru-	a list of all said Diesel Construction Retrofit List," that will be used in connection with this Contract by I hereby certify that the information on the attached Diesel Retrofit s of the date of signature. The List includes the following information for ction Equipment:			
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	Equipment type, ma Vehicle Identification Engine model and y Engine HP rating; Emission Control D ECD make, model, ECD EPA or CARE meets or exceeds er by EPA or CARB; ECD installation da Type of fuel to be u Whether the equipm	 ike, model; on Number or VIN; 'ear of manufacture; 'evice ("ECD") type (Diesel Oxidation Catalyst or Diesel Particulate Filter); and manufacturer; 3 Verification Number or manufacturer's certification that the DOC or DPF nission reductions provided by similar emission control technology verified te; sed; and nent is owned or rented. 			

APPENDIX B (cont.)

DIESEL RETROFIT PROGRAM CONTRACTOR CERTIFICATION

shall notify DEP within 48 ho	ours of any new Diesel Construction Equipment			
brought onto the Contract site.	shall maintain detailed records of all			
Diesel Construction Equipment used at the Contract site	e, including the dates and duration times the			
Diesel Construction Equipment is used at the Contract s	site shall make such			
records available for inspection by DEP.	shall ensure that the emissions control			
technology for each piece of Diesel Construction Equip	ment is operated, maintained, and serviced as			
recommended by the manufacturer.	shall retrofit prior to the end of the			
Contract any Diesel Construction Equipment no longer exempt from meeting the Diesel Construction				
Equipment Standard under exemption 3 (because it had an engine that met the EPA particulate matter				
(PM) Tier emission standards currently in effect at the start of the Contract for non-road diesel engines				
for the applicable engine power group and such emission	ons standards were superseded during the			
Contract).				
•				

I acknowledge that this certificate is being furnished as a requirement under this Contract and is subject to applicable State and federal laws, both criminal and civil. Signed under pains and penalty of perjury on this date _____.

Signature_____

Name: _____

Title:

ATTACHMENT O

Prevailing Wage Certification

THIS FORM MUST BE SIGNED AND ACCOMPANY YOUR BID

The Town of West Springfield, Massachusetts

Bidder's Certification Regarding Payment of Prevailing Wages

The undersigned Bidder hereby certifies, under the pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of the wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Industries.

The undersigned Bidder agrees to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of:

- (1)The failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or
- (2)The Failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

Date:_____

Name of Bidder:

By:______(Signature)

Print Name & Title of Person Signing

ATTACHMENT P

Tax Certification Statement

TAX CERTIFICATION STATEMENT

The statement below deals with the Revenue Enforcement and Protection Program (REAP) enacted by the Massachusetts Legislature Sections 35 and 36 of Chapter 233 of the Acts and Resolves of 1983.

Pursuant of MGL Ch. 62C Sec. 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.

Social Security Number or Federal Identification Number:

Signature of Individual or Corporate Name: _____

By:

Corporate Officer (If-Applicable) SECTION 00430 BID BOND

BID BOND (PENAL SUM FORM)

Bidder	Surety	
Name:	Name:	
Address (principal place of business):	Address (principal place of business):	
Owner	Bid	
Name: Town of West Springfield	Project (name and location):	
Address (principal place of business):	BIRNIE AVENUE/PIPER ROAD AREA	
26 Central Street	SEWER EXPANSION PROJECT	
West Springfield, MA 01089	CONTRACT NUMBER 1	
	TOWN BID NO. 20-0013	
	Bid Due Date:	
Bond		
Penal Sum:		
Date of Bond:		
Surety and Bidder, intending to be legally boun	d hereby, subject to the terms set forth in this Bid Bond,	
do each cause this Bid Bond to be duly executed	d by an authorized officer, agent, or representative.	
Bidder	Surety	
(Full formal name of Bidder)	(Full formal name of Surety) (corporate seal)	
By:	By:	
(Signature)	(Signature) (Attach Power of Attorney)	
Name:	Name:	
(Printed or typed)	(Printed or typed)	
litle:		
Attest:	Attest:	
(Signature)	(Signature)	
Name:	_ Name:	
Title:	Title	
Notoe: (1) Noto: Addrossos are to be used for giving enurs	aurad natica (2) Dravida avacution by any additional partice such as	
ioint venturers, if necessary.	quired notice. (2) Frovide execution by any additional parties, such as	

- 1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
- 2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
- 3. This obligation will be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner, or
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
- 4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
- 5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
- 6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
- 7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
- 8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
- 9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
- 10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
- 11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 00500 AGREEMENT

SECTION 00500 AGREEMENT

THIS AGREEMENT is by and between	Town of West Springfield	("Owner") and
----------------------------------	--------------------------	---------------

("Contractor").

Owner and Contractor hereby agree as follows:

1. WORK

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Birnie Avenue/Piper Road Area Sewer Expansion Project CWSRF No. 4513, Contract No. 1, Town Bid No. 20-0013.

2. DEFINITIONS

- a. Acceptance: All Contracts require proper acceptance of the described good or services by the Town of West Springfield. Proper acceptance shall be understood to include inspection of goods and certification of acceptable performance of services by authorized representatives of the Town to ensure that the goods or services are complete and are as specified in the Contract.
- b. Contract Documents: All documents relative to the Contract including (where used), but not limited to, Instructions to Bidders, Proposal Form, General Conditions, Supplementary General Conditions, General Specifications, Other Specifications included in IFB, Drawings, and all Addenda issued during the bidding period. The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper performance of the Contract.
- c. The Contractor: The "other party" to any contract with the Town. The term shall (as the sense and particular contract so require) include Vendor, Contractor, Engineer, or other label used to identify the other party in the particular Contract, Use of the term "Contractor" shall be understood to refer to any other such label used.
- d. Date of Substantial Performance: The date when the work is sufficiently complete, the services are performed, or the goods delivered, in accordance with Contract Documents, as modified by Amendments and Change Orders.
- e. Goods: Goods, Supplies, or Materials.
- f. Subcontractor: Those having a direct Contract with the Contractor. The term includes one who furnished material worked to a special design according to the Drawings or Specifications of this work, but does not include one who merely furnishes material not so worked.
- g. Work: The services or materials contracted for, or both

3. ENGINEER

The Engineer for the Project is Mott MacDonald and who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

4. CONTRACT TIMES FOR PERFORMANCE

a. <u>Time of the Essence</u>

All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

b. Dates for Substantial Completion and Final Payment

The time for completion of this contract is 470 calendar days, unless extended pursuant to a provision for extension contained in the Contract Documents at the sole discretion of the Town, and not subject to assent by the Contractor, and subject to the availability and appropriation of funds.

The Work related to the Valley View Sewershed (Hemlock Hill Road, Sweetfern Drive, Woodbrook Terrace, and Valley View Circle) will be Substantially completed by October 31, 2020.

All other Work will be Substantially completed by June 30, 2021, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions by July 31, 2021.

c. <u>Liquidated Damages</u>

Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.b above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$2,000 for each day that expires after the times specified in Paragraph 4.b for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$2,000 for each day that expires after the times specified in Paragraph 4.b for completion and readiness for final payment until the Work is complete and ready for final payment.

5. CONTRACT PRICE

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraph 5.a and 5.b below:

a. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item.

As provided in the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer as provided in the General Conditions. Unit prices have been computed as provided in the General Conditions.

- b. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.
- c. Notwithstanding anything in the Contract Documents to the contrary, any and all payments which the Town is required to make under this Contract shall be subject to appropriation or other availability of funds as certified by the Town Accountant.
- d. This Contract is only binding upon, and enforceable against, the Town if: (1) the Contract is signed by the Mayor as Chief Procurement Officer or his/her designee; and (2) endorsed with approval by the Town Accountant as to appropriation or availability of funds; and (3) endorsed with approval by the Town Counsel as to form.

6. PAYMENT PROCEDURES

- a. <u>Submittal and Processing of Payments</u> Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.
- b. <u>Progress Payments; Retainage</u>

Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment of each month during performance of the Work provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the schedule of values established as provided in Paragraph 2.05.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

- c. Owner shall retain from progress payments 5-percent of the value of Work completed.
- d. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 99-percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 15.01.E of the General Conditions and less Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.
- e. Final Payment

Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price, and any remaining funds, as recommended by Engineer as provided in said Paragraph 15.06.

7. INTEREST

N/A

8. CONTRACTOR'S REPRESENTATIONS

In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- a. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Contract Documents.
- b. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- c. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work. The Contractor shall give all notices and comply with all laws and regulations bearing on the performance of this Contract. If the Contractor performs the Contract in violation of any applicable law or regulation, the Contractor shall bear all costs arising there from. Wherever applicable law mandates the inclusion of any term and provision into a municipal contract, this Section shall be understood to import such term or provision into this Contract. To whatever extent any provision of this Contract shall be inconsistent with any law or regulation limiting the power or liability of cities and towns, such law or regulation shall control.
- d. The Contractor shall keep itself fully informed of all existing and future State and National Laws and Municipal Bylaw and regulations and of all orders and decrees of any bodies or tribunals having jurisdiction in any manner affecting those engaged or employed in the work, of the materials used in the work, or in any way affecting the conduct of the work, if any discrepancy or inconsistency is discovered in the Drawings, Specifications or Contract for this work in violation of any such law, by-law, regulation, order or decree, it shall forthwith report the same in writing to the Town. It shall, at all times, itself observe and comply with and shall cause all its agents, employees and Subcontractors to observe and shall protect and indemnify the Town of West Springfield, and its duly appointed agents against any claim or liability arising from or based on any violation whether by him or its agents, employees or Subcontractors or any such law, by-law, regulation or decree.
- e. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions.
- f. Contractor has considered the information known to Contractor, information and observations obtained from visits to the Site, information commonly known to contractors doing business in the locality of the Site, the Contract Documents, and the reports and drawings identified in the Contract Documents with respect to the effect of such information and observations on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be

employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Contractor's safety precautions and programs.

- g. Based on the information and observations referred to in the preceding paragraph, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- h. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- i. Contractor is prepared to comply with the applicable requirements of Owner's safety program, if any.
- j. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- k. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

9. CONTRACT DOCUMENTS

- a. <u>Contents</u>
 - 1. The Contract Documents consist of the following:
 - (a) This Agreement (pages 00500-1 to 00500-11, inclusive).
 - (b) Bid Bond (pages 00430-1 to 00430-2, inclusive).
 - (c) Performance Bond (pages 00610-1 to 00610-4, inclusive).
 - (d) Payment Bond (pages 00615-1 to 00615-4, inclusive).
 - (e) Notice of Award.
 - (f) Notice to Proceed.
 - (g) General Conditions (title pages, table of contents, and pages 1 to 70, inclusive).
 - (h) Supplementary Conditions (pages SC-1 to SC-13, inclusive with attachments).
 - (i) Specifications bearing the title Birnie Avenue/Piper Road Area Sewer Expansion Project, as listed in the table of contents of the Project Manual.
 - (j) Drawings consisting of 64 sheets with each sheet bearing the following general title: Birnie Avenue/Piper Road Area Sewer Expansion Project. (Note: Drawings have been furnished by Engineer and are not attached to this Agreement).
 - (k) Addenda (numbers _____ to ____, inclusive).
 - (l) Exhibits to this Agreement (enumerated as follows):
 - 1) Contractor's Bid (pages 00410-1 to 00410-31, inclusive).
 - (m) The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - 1) Notice to Proceed.
 - 2) Work Change Directives.
 - 3) Change Orders.
 - 4) Field Orders

- b. The documents listed in Paragraph 9.a.1 are attached to this Agreement (except as expressly noted otherwise above).
- c. There are no Contract Documents other than those listed above in this Paragraph 9.
- d. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

10. MISCELLANEOUS

a. <u>Terms</u>

Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions, unless otherwise described herein.

b. Assignment of Contract

No assignment by Contractor of any rights under or interests in the Contract will be binding on Owner without the written consent of Owner; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge Contractor from any duty or responsibility under the Contract Documents.

c. Successors and Assigns

Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

d. Severability

Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

e. <u>Contractor's Certifications</u>

Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 9.e:

- 1. "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution.
- 2. "Fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
- 3. "Collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels.
- 4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.
- f. Other Provisions Town Requirements
 - 1. Permits, Licenses, Approvals and all other legal or administrative prerequisites to its performance of the Contract shall be secured and paid by the Contractor.
 - 2. Failure of the Contractor to comply with any of the terms or conditions of this Contract shall he deemed a material breach of this Contract, and the Town of West Springfield shall have all the rights and remedies provided in the Contract Documents, the right to cancel, terminate, or suspend the Contract in whole or in part, the right to maintain any and all actions at law or in equity or other proceedings with respect to a breach of this Contract including damages and specific performance and the right select among the remedies available to it by all of the above.
 - 3. To the full extent permitted by law, no official, employee, agent or representative of the Town of West Springfield shall be individually or personally liable on any obligation of the Town under this Contract.
 - 4. Any notice permitted or required under the provisions of this Contract to be given or served by either of the parties hereto upon the other party hereto shall be in writing and signed in the name or on the behalf of the party giving or serving the same. Notice shall be deemed to have been received at the time of actual service or three (3) business days after the date of a certified or registered mailing properly addressed. Notice to the Contractor shall be deemed sufficient if sent to the address set forth in the Contract, and to the Town of West Springfield, Town Hall, 26 Central Street, West Springfield, Massachusetts.
 - 5. This Contract shall be binding upon the Contractor, its assignees, transferees, and/or successors in interest (and where not corporate, the heirs and estate of the Contractor).
 - 6. This instrument together with its endorsed supplements, and the other components of the Contract Documents, constitutes the entire contract between the parties, with no agreements other than those incorporated herein.
- g. Other Provisions MassDEP SRF Loan Program Requirements
 - 1. The fair share goals for disadvantaged business enterprise (DBE) participation for this contract are a minimum of 4.2 percent Disadvantaged Minority Business Enterprise (D/MBE) participation and 4.5 percent Disadvantaged Women Business Enterprise(D/WBE) participation, applicable to the total dollar amount paid for the construction contract. The Contractor shall take all affirmative steps necessary to achieve this goal, and shall provide reports documenting the portion of contract and subcontract dollars paid to DBEs, and its efforts to achieve the goals, with each invoice submitted or at such greater intervals as specified by the Owner. The contractor shall require similar reports from its subcontractors.

2. Equal Employment Opportunity/Affirmative Action (EEO/AA) Requirements

During the performance of this contract, the contractor agrees as follows:

- (a) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- (b) The contractor will, in all solicitations or advancements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
- (c) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (d) The contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- (e) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders. Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230.
- (f) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

- (g) The contractor will include the provisions of paragraphs (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States." [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966-1970.
- 3. The contractor shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue code 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.
- 4. As per DEP's Policy Memorandum #10, the agreed upon DIRECT LABOR MARKUP (percentage) for Change Orders on this project shall be _____ percent. Change Orders will be submitted on MassDEP's forms with appropriate documentation listed in MassDEP's Policy Memorandum #10.
- 5. The Contractor acknowledges to and for the benefit of the Town of West Springfield ("Owner") and the Commonwealth of Massachusetts (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and the State that (a)the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Owner). While the Contractor has no direct contractual privity with the State, as a lender to the Owner for the funding of its project, the Owner and the Contractor agree that the State is a thirdparty beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

- 6. All contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under MGL Chapter 30 section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and Portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent.
- 7. All construction contracts are subject to the Davis Bacon wage rate requirements as found in Section 00800.
- 8. The Contractor agrees that it will fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons). The Contractor shall not award any subcontracts or purchase any materials from suppliers that appear on the Excluded Parties List System. The Contractor shall include this requirement in each subcontract and require it to be included in all subcontracts regardless of tier. The Contractor shall maintain reasonable records to demonstrate compliance with these requirements.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on	(which is the Effective Date of the Agreement).
OWNER:	CONTRACTOR
By:	By:
Title:	Title:
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest:	Attest:
Title:	Title:
Address for giving notices:	Address for giving notices:
	[License No.:
(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach	(Where applicable) NOTE TO USER: Use in those states or other jurisdictions where applicable or required.
evidence of authority to sign and resolution or other documents authorizing execution of Owner-Contractor Agreement.)	Agent for service of process:

Pursuant to M.G.L. c.44, s31C, I certify that an appropriation has been made in the total amount of the contract.

Date

Signed

Title (Owner's Auditor/Accountant)

END OF SECTION

507408636-002 February 2020 00500-11

SECTION 00510 NOTICE OF AWARD

SECTION 00510 NOTICE OF AWARD

TO:_____

Project Description: TOWN OF WEST SPRINGFIELD BIRNIE AVENUE/PIPER ROAD AREA SEWER EXPANSION PROJECT CWSRF-4513, Contract No. 1, Town Bid No. 20-0013

The Owner has considered the Proposal submitted for the above described Work in response to its Bid Advertisement dated ______ and Instructions to Bidders.

You are required by the Contract Documents to execute the Contract and furnish the Performance Bond, Certificates of Insurance (with copies of the policies including all endorsements), within ten (10) days, Sundays and holidays excepted, from the date of this Notice of Award.

If you fail to execute the Contract and to furnish satisfactory bonds, evidences of insurance and other required documents within ten (10) days, Sundays and holidays excepted, from the date of this Notice of Award, or within such further time period as you and Owner may in writing agree, the Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your bid as abandoned and as a forfeiture of your bid security. The Owner will also be entitled to such other rights as may be provided by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the Owner.

Dated this	day of	, 2020		
		·	Town	of West Springfield
			OWNER	
			BY:	Robert J Colson
			TITLE:	Director – Public Works
		ACCEPTAN	CE OF NOTICE	
Receipt of the this <u>day</u> o	e above NOTICE f	E OF AWARD is 1 , 2020	hereby acknowle	edged by:
Ву			Title	

SECTION 00550 NOTICE TO PROCEED

SECTION 00550 NOTICE TO PROCEED

ТО:	DATE:
	PROJECT:

You are hereby notified to commence WORK in accordance with the Contract dated _______, 2020, on or before _______, 2020, and you are to complete all WORK within four hundred seventy (470) consecutive calendar days thereafter. The date of completion of all WORK is therefore July 31,2021.

	Town of West Springfield
OWNER	
BY:	Robert J. Colson

TITLE: Director – Public Works

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged

by:______this the _____ day of ______, 2020,

By: _____ Title _____

SECTION 00610 PERFORMANCE BOND

PERFORMANCE BOND

Contractor	Surety
Name:	Name:
Address (principal place of business):	Address (principal place of business):
Owner	Contract
Name: Town of West Springfield	Description (name and location):
Mailing address (principal place of business):	BIRNIE AVENUE/PIPER ROAD AREA
26 Central Street	SEWER EXPANSION PROJECT
West Springfield, MA 01089	CONTRACT NUMBER #1
	TOWN BID NUMBER #20-0013
	Contract Price:
	Effective Date of Contract:
Bond	
Bond Amount:	
Date of Bond:	
(Date of Bond cannot be earlier than Effective Date of Contract)	
□ None □ See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this	
Performance Bond, do each cause this Performance	Bond to be duly executed by an authorized officer,
Contractor as Principal	Surety
	Survey
(Full formal name of Contractor)	(Full formal name of Surety) (corporate seal)
Ву:	Ву:
(Signature)	(Signature)(Attach Power of Attorney)
Name:(Printed or typed)	Name:(Printed or typed)
Title:	Title:
Attest:	Attest:(Signature)
Name:	Name:
(Printed or typed)	
(initial of typed)	(Printed or typed)
Title:	(Printed or typed) Title:
Title: Notes: (1) Provide supplemental execution by any additional pa	(Printed or typed) Title: rties, such as joint venturers. (2) Any singular reference to berg applicable

EJCDC® C-610, Performance Bond.

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

- 1. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
- 2. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 2.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 2.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 2.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
- 3. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
- 4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 4.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 4.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
- 5. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
- 6. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 6.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 6.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 6.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
- 7. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
- 8. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 9. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
- 10. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 11. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 12. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

- 13. Definitions
 - 13.1. Balance of the Contract Price—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 13.2. Construction Contract—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 13.3. Contractor Default—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 13.4. Owner Default—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 13.5. Contract Documents—All the documents that comprise the agreement between the Owner and Contractor.
- 14. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
- 15. Modifications to this Bond are as follows: [Describe modification or enter "None"]

SECTION 00615 PAYMENT BOND

PAYMENT BOND

Contractor	Surety
Name:	Name: [Full formal name of Surety]
Address (principal place of business):	Address (principal place of business):
	[Address of Surety's principal place of business]
Ourses	Contract
Owner	Contract
Name: Town of West Springfield	
Mailing address (principal place of business):	SEWER EXPANSION PROJECT
26 Central Street West Springfield MA 01089	CWSRF NO. 4513
west springheid, with 01007	CONTRACT NUMBER #1
	TOWN BID NO. 20-0013
	Contract Price
	Effective Date of Contract:
Pond	
Bolia Bond Amount	
Bond Amount:	
Date of Bond:	
(Date of Bond cannot be earlier than Effective Date of Contract) Modifications to this Bond form:	
□ None □ See Paragraph 18	
Surety and Contractor, intending to be legally bour	nd hereby, subject to the terms set forth in this
Payment Bond, do each cause this Payment Bond t	o be duly executed by an authorized officer, agent, or
Contractor as Principal	Surety
(Full formal name of Contractor)	(Full formal name of Surety) (corporate seal)
Ву:	Ву:
(Signature)	(Signature)(Attach Power of Attorney)
Name:(Printed or typed)	Name:(Printed or typed)
Title.	Title
Attest:	Attest:
(Signature)	(Signature)
Name:(Printed or typed)	Name:(Printed or typed)
Title	(Printed of typed)
Notes: (1) Provide supplemental execution by any additional n	arties such as joint venturers (2) Any singular reference to
notes. (1) novide supplemental execution by any additional p	
Contractor, Surety, Owner, or other party is considered plural	where applicable.

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- 1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
- 2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
- 3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
- 4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
- 5. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 5.1. Claimants who do not have a direct contract with the Contractor
 - 5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
- 6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
- 7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2. Pay or arrange for payment of any undisputed amounts.
 - 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety

shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

- 8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
- 9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
- 10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
- 11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
- 12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
- 14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
- 15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
- 16. Definitions
 - 16.1. Claim—A written statement by the Claimant including at a minimum:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

- 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
- 16.1.4. A brief description of the labor, materials, or equipment furnished;
- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
- 16.1.7. The total amount of previous payments received by the Claimant; and
- 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2. Claimant—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3. Construction Contract—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4. Owner Default—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5. Contract Documents—All the documents that comprise the agreement between the Owner and Contractor.
- 17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
- 18. Modifications to this Bond are as follows: [Describe modification or enter "None"]

SECTION 00700 GENERAL CONDITIONS Just This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
 - 1. Addenda—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 - 2. Agreement—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 - 3. Application for Payment—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 - 4. Bid—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 - 5. Bidder—An individual or entity that submits a Bid to Owner.
 - 6. Bidding Documents—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 - 7. Bidding Requirements—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 - 8. Change Order—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 - 9. Change Proposal—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 - 10. Claim
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
- c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
- d. A demand for money or services by a third party is not a Claim.
- 11. Constituent of Concern—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
- 12. Contract—The entire and integrated written contract between Owner and Contractor concerning the Work.
- 13. Contract Documents—Those items so designated in the Agreement, and which together comprise the Contract.
- 14. Contract Price—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
- 15. Contract Times—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
- 16. Contractor—The individual or entity with which Owner has contracted for performance of the Work.
- 17. Cost of the Work—See Paragraph 13.01 for definition.
- 18. Drawings—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
- 19. Effective Date of the Contract—The date, indicated in the Agreement, on which the Contract becomes effective.
- 20. Electronic Document—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
- Electronic Means—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

- 22. Engineer—The individual or entity named as such in the Agreement.
- 23. Field Order—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
- 24. Hazardous Environmental Condition—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
- 25. Laws and Regulations; Laws or Regulations—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 26. Liens—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
- 27. Milestone—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
- 28. Notice of Award—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
- 29. Notice to Proceed—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
- 30. Owner—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
- 31. Progress Schedule—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
- 32. Project—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

- 33. Resident Project Representative—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
- 34. Samples—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
- 35. Schedule of Submittals—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.
- 36. Schedule of Values—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
- 37. Shop Drawings—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
- 38. Site—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
- 39. Specifications—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
- 40. Subcontractor—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
- 41. Submittal—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections; and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
- 42. Substantial Completion—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

- 43. Successful Bidder—The Bidder to which the Owner makes an award of contract.
- 44. Supplementary Conditions—The part of the Contract that amends or supplements these General Conditions.
- 45. Supplier—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
- 46. Technical Data
 - a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
- 47. Underground Facilities—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
- 48. Unit Price Work—Work to be paid for on the basis of unit prices.
- 49. Work—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
- 50. Work Change Directive—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. Day: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.
- D. Defective: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. Furnish, Install, Perform, Provide
 - 1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. Contract Price or Contract Times: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

- 2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance
 - A. Performance and Payment Bonds: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
 - B. Evidence of Contractor's Insurance: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
 - C. Evidence of Owner's Insurance: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.
- 2.02 Copies of Documents
 - A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
 - B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.
- 2.03 Before Starting Construction
 - A. Preliminary Schedules: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

- 2.04 Preconstruction Conference; Designation of Authorized Representatives
 - A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
 - B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 Acceptance of Schedules

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.
- 2.06 Electronic Transmittals
 - A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
 - B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
 - C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

- 3.01 Intent
 - A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
 - B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
 - C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
 - D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
 - E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
 - F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
 - G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 Reference Standards

- A. Standards Specifications, Codes, Laws and Regulations
 - Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility
inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

- 3.03 Reporting and Resolving Discrepancies
 - A. Reporting Discrepancies
 - 1. Contractor's Verification of Figures and Field Measurements: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
 - 2. Contractor's Review of Contract Documents: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
 - 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.
 - B. Resolving Discrepancies
 - 1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).
- 3.04 Requirements of the Contract Documents
 - A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation— RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 Reuse of Documents

- A. Contractor and its Subcontractors and Suppliers shall not:
 - have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

- 4.01 Commencement of Contract Times; Notice to Proceed
 - A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.
- 4.02 Starting the Work
 - A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.
- 4.03 Reference Points
 - A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 Progress Schedule

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 Delays in Contractor's Progress

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
 - 1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 - 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 - 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
 - 1. The circumstances that form the basis for the requested adjustment;
 - 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 - 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 - 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 - 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

- 5.01 Availability of Lands
 - A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.
- 5.02 Use of Site and Other Areas
 - A. Limitation on Use of Site and Other Areas
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
 - B. Removal of Debris During Performance of the Work: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. Cleaning: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. Loading of Structures: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.
- 5.03 Subsurface and Physical Conditions
 - A. Reports and Drawings: The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
 - B. Underground Facilities: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
 - C. Reliance by Contractor on Technical Data: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.
 - D. Limitations of Other Data and Documents: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 - 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 - 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

- 5.04 Differing Subsurface or Physical Conditions
 - A. Notice by Contractor: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
 - 1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 - 2. is of such a nature as to require a change in the Drawings or Specifications;
 - 3. differs materially from that shown or indicated in the Contract Documents; or
 - is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. Engineer's Review: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. Owner's Statement to Contractor Regarding Site Condition: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. Early Resumption of Work: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. Possible Price and Times Adjustments
 - 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
- b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
- c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
- 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. Underground Facilities; Hazardous Environmental Conditions: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.
- 5.05 Underground Facilities
 - A. Contractor's Responsibilities: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
 - 1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - complying with applicable state and local utility damage prevention Laws and Regulations;

- 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
- 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
- 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. Notice by Contractor: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. Engineer's Review: Engineer will:
 - 1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 - 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 - 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 - 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. Owner's Statement to Contractor Regarding Underground Facility: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. Early Resumption of Work: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. Possible Price and Times Adjustments
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
- b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
- c. Contractor gave the notice required in Paragraph 5.05.B.
- 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
- 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
- 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.
- 5.06 Hazardous Environmental Conditions at Site
 - A. Reports and Drawings: The Supplementary Conditions identify:
 - 1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
 - 2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 - 3. Technical Data contained in such reports and drawings.
 - B. Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

of construction to be employed by Contractor, and safety precautions and programs incident thereto;

- 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

- 6.01 Performance, Payment, and Other Bonds
 - A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
 - B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
 - C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.
- 6.02 Insurance—General Provisions
 - A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
 - B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
 - C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
 - D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.
- 6.03 Contractor's Insurance
 - A. Required Insurance: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
 - B. General Provisions: The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
 - C. Additional Insureds: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

- 4. not seek contribution from insurance maintained by the additional insured; and
- 5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.
- 6.04 Builder's Risk and Other Property Insurance
 - A. Builder's Risk: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
 - B. Property Insurance for Facilities of Owner Where Work Will Occur: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
 - C. Property Insurance for Substantially Complete Facilities: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
 - D. Partial Occupancy or Use by Owner: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
 - E. Insurance of Other Property; Additional Insurance: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.
- 6.05 Property Losses; Subrogation
 - A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

- 1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
- 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
 - 1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

- 6.06 Receipt and Application of Property Insurance Proceeds
 - A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
 - B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
 - C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

- 7.01 Contractor's Means and Methods of Construction
 - A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
 - B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.
- 7.02 Supervision and Superintendence
 - A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
 - B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.
- 7.03 Labor; Working Hours
 - A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.
- 7.04 Services, Materials, and Equipment
 - A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
 - B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
 - C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.
- 7.05 "Or Equals"
 - A. Contractor's Request; Governing Criteria: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
- 3) has a proven record of performance and availability of responsive service; and
- 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. Contractor's Expense: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. Engineer's Evaluation and Determination: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. Effect of Engineer's Determination: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. Treatment as a Substitution Request: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. Contractor's Request; Governing Criteria: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
 - Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

- 3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. Engineer's Evaluation and Determination: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. Reimbursement of Engineer's Cost: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for evaluating of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. Effect of Engineer's Determination: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.
- 7.07 Concerning Subcontractors and Suppliers
 - A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
 - B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
 - C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
 - D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
 - E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
 - F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
 - G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.
- 7.08 Patent Fees and Royalties
 - A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
 - B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
 - C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 Permits

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.
- 7.10 Taxes
 - A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.
- 7.11 Laws and Regulations
 - A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
 - B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
 - C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.
- 7.12 Record Documents
 - A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.
- 7.14 Hazard Communication Programs
 - A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- 7.15 Emergencies
 - A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 Submittals

- A. Shop Drawing and Sample Requirements
 - 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
 - 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

- 3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. Submittal Procedures for Shop Drawings and Samples: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
 - 1. Shop Drawings
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 - 2. Samples
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 - 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. Engineer's Review of Shop Drawings and Samples
 - 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 - 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
 - 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 - 4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

- 5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
- 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
- 7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
- 8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.
- D. Resubmittal Procedures for Shop Drawings and Samples
 - 1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
 - 2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
 - 3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.
- E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs
 - 1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
- 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.
- 7.17 Contractor's General Warranty and Guarantee
 - A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
 - B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
 - C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
 - D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or

- 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.
- 7.18 Indemnification
 - A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
 - B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- 7.19 Delegation of Professional Design Services
 - A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
 - B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
 - C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

- 8.01 Other Work
 - A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
 - B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
 - C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
 - D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 Coordination

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.
- 8.03 Legal Relationships
 - A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

- 9.01 Communications to Contractor
 - A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.
- 9.02 Replacement of Engineer
 - A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.
- 9.03 Furnish Data
 - A. Owner shall promptly furnish the data required of Owner under the Contract Documents.
- 9.04 Pay When Due
 - A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

- 9.05 Lands and Easements; Reports, Tests, and Drawings
 - A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 Insurance
 - A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 Change Orders
 - A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 Inspections, Tests, and Approvals
 - A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 Limitations on Owner's Responsibilities
 - A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 Undisclosed Hazardous Environmental Condition
 - A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 Evidence of Financial Arrangements
 - A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 Safety Programs
 - A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

- 10.01 Owner's Representative
 - A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.
- 10.02 Visits to Site
 - A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
 - B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.
- 10.03 Resident Project Representative
 - A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
 - B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.
- 10.04 Engineer's Authority
 - A. Engineer has the authority to reject Work in accordance with Article 14.
 - B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
 - C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
 - D. Engineer's authority as to changes in the Work is set forth in Article 11.

- E. Engineer's authority as to Applications for Payment is set forth in Article 15.
- 10.05 Determinations for Unit Price Work
 - A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.
- 10.06 Decisions on Requirements of Contract Documents and Acceptability of Work
 - A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.
- 10.07 Limitations on Engineer's Authority and Responsibilities
 - A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
 - B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
 - C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
 - D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
 - E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.
- 10.08 Compliance with Safety Program
 - A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.
ARTICLE 11—CHANGES TO THE CONTRACT

11.01 Amending and Supplementing the Contract

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.
- 11.02 Change Orders
 - A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
 - B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 Work Change Directives

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 Field Orders

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.
- 11.05 Owner-Authorized Changes in the Work
 - A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
 - B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
 - C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.
- 11.06 Unauthorized Changes in the Work
 - A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.
- 11.07 Change of Contract Price
 - A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
 - B. An adjustment in the Contract Price will be determined as follows:

- 1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
- 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
- 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. Contractor's Fee: When applicable, the Contractor's fee for overhead and profit will be determined as follows:
 - 1. A mutually acceptable fixed fee; or
 - 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

- 11.08 Change of Contract Times
 - A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
 - B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.
- 11.09 Change Proposals
 - A. Purpose and Content: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.
 - B. Change Proposal Procedures
 - 1. Submittal: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
 - 2. Supporting Data: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. Engineer's Initial Review: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. Engineer's Full Review and Action on the Change Proposal: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

- 5. Binding Decision: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. Resolution of Certain Change Proposals: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. Post-Completion: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 Notification to Surety

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 Claims

- A. Claims Process: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 - 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. Submittal of Claim: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. Review and Resolution: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. Mediation
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. Partial Approval: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. Denial of Claim: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. Final and Binding Results: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

- A. Purposes for Determination of Cost of the Work: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

- 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. Costs Included: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

- 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
- 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
- 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
- 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.
- c. Construction Equipment Rental
 - 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.

- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. Costs Excluded: The term Cost of the Work does not include any of the following items:
 - 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. Contractor's Fee
 - 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. Documentation and Audit: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. Cash Allowances: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. Owner's Contingency Allowance: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of

Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

- E. Adjustments in Unit Price
 - 1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
 - 2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
 - 3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

- 14.01 Access to Work
 - A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.
- 14.02 Tests, Inspections, and Approvals
 - A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
 - B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
 - C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.
- 14.03 Defective Work
 - A. Contractor's Obligation: It is Contractor's obligation to assure that the Work is not defective.
 - B. Engineer's Authority: Engineer has the authority to determine whether Work is defective, and to reject defective Work.
 - C. Notice of Defects: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
 - D. Correction, or Removal and Replacement: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
 - E. Preservation of Warranties: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
 - F. Costs and Damages: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

- 14.04 Acceptance of Defective Work
 - A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 Uncovering Work

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.
- 14.06 Owner May Stop the Work
 - A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

- 14.07 Owner May Correct Defective Work
 - A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
 - B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
 - C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
 - D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

- 15.01 Progress Payments
 - A. Basis for Progress Payments: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
 - B. Applications for Payments
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

- 3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
- 4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. Review of Applications
 - Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 - 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
 - 3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

- 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
- 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
- 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.
- D. Payment Becomes Due
 - 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.
- E. Reductions in Payment by Owner
 - 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
- c. Contractor has failed to provide and maintain required bonds or insurance;
- d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
- e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
- f. The Work is defective, requiring correction or replacement;
- g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
- h. The Contract Price has been reduced by Change Orders;
- i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
- j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
- k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
- I. Other items entitle Owner to a set-off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 Contractor's Warranty of Title

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.
- 15.03 Substantial Completion
 - A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.
- 15.04 Partial Use or Occupancy
 - A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

- 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
- 2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
- 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
- 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.
- 15.05 Final Inspection
 - A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.
- 15.06 Final Payment
 - A. Application for Payment
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
 - 2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
- e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. Engineer's Review of Final Application and Recommendation of Payment: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. Notice of Acceptability: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. Completion of Work: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. Final Payment Becomes Due: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.
- 15.07 Waiver of Claims
 - A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.
- 15.08 Correction Period
 - A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
 - B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
 - C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
 - D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
 - E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

- 16.01 Owner May Suspend Work
 - A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.
- 16.02 Owner May Terminate for Cause
 - A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
 - B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
 - C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
 - D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
 - E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.
- 16.03 Owner May Terminate for Convenience
 - A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
 - B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.
- 16.04 Contractor May Stop Work or Terminate
 - A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
 - B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

- 17.01 Methods and Procedures
 - A. Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
 - B. Final Resolution of Disputes: For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

- 18.01 Giving Notice
 - A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.
- 18.02 Computation of Times
 - A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

- 18.03 Cumulative Remedies
 - A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.
- 18.04 Limitation of Damages
 - A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.
- 18.05 No Waiver
 - A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.
- 18.06 Survival of Obligations
 - A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.
- 18.07 Controlling Law
 - A. This Contract is to be governed by the law of the state in which the Project is located.
- 18.08 Assignment of Contract
 - A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.
- 18.09 Successors and Assigns
 - A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.
- 18.10 Headings
 - A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800 SUPPLEMENTARY CONDITIONS

SECTION 00800

SUPPLEMENTARY CONDITIONS

PART 1 AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01 Delete paragraph 1.01A.39 in its entirety and insert the following in its place:

1.01A.39. Specifications – Sections included under Division 1 through Division 16 of the Project Manual.

SC-1.01 Add the following language at the end of the first sentence of paragraph 1.01A.42:

or has been completed except for work having a contract price of less than one percent of the then adjusted total Contract Price.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01 Replace paragraph 3.01.E with the following paragraph:

3.01.E. In the event of conflicts, inconsistencies or discrepancies among the Contract Documents, to the extent applicable, the better quality or greater quantity of work shall be provided without change to the Contract Price. In the event of such conflicts, inconsistencies or discrepancies which do not relate to the quality or quantity of work, the Contractor shall request clarifications or interpretations from the Engineer as provided herein.

SC-3.01 Add the following new paragraph immediately after paragraph 3.01.G:

3.01.H. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01 Delete paragraph 4.01A in its entirety and insert the following in its place:

4.01A The Contract Times will commence to run on the date specified in the Notice to Proceed.

ARTICLE 5 - SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Add the following new paragraph immediately after Paragraph 5.03.D.4:

5.03.E In the preparation of Drawings and Specifications, Engineer has relied upon the data obtained from tests of subsurface and latent physical conditions of the site. Such data is in the form of boring logs which are included in the Project Manual and soil samples which may be examined at Engineer's office during regular business hours. The locations of the test borings are shown on the Drawings. Such logs and samples are not part of the Contract Documents.

5.03.E.1 The subsurface data are not guaranteed as to accuracy or completeness.

5.03.E.2 Bidders are cautioned that the subsurface data have been utilized for general design purposes only. No explicit or implicit representation is made as to the nature of the materials which may be encountered below the surface of the ground.

5.03.E.3 The making available of this subsurface data to Bidders is not intended to relieve them from their responsibility to familiarize themselves with subsurface and other site conditions.

SC-5.04 Add the following new paragraph immediately after Paragraph 5.04.E.4:

5.04.E.5 Adjustments resulting from subsurface or latent physical conditions will be in accordance with Massachusetts General Law Chapter 30, Section 39N referenced in Part II of the Supplementary Conditions.

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

5.06.A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to the Owner.

5.06.B. Not used.

ARTICLE 6 - BONDS AND INSURANCE

SC-6.03 Add the following new paragraphs immediately after Paragraph 6.03.B.5:

6. Confirm that the General Liability policy covers only the Work under this Contract, with project specific limits.

7. Confirm that automobile insurance covers all Scheduled, Hired and Non-Owned vehicles.

8. Include names of all additional insureds as specified herein.

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages:

State:	Statutory
Employer's Liability:	
Bodily injury, each accident	\$1,000,000
Bodily injury by disease, each employee	\$1,000,000
Bodily injury/disease aggregate	\$1,000,000

2. Contractor's Commercial General Liability:

General Aggregate	\$1,000,000
Products - Completed Operations Aggregate	\$1,000,000
Personal and Advertising Injury	\$1,000,000
Each Occurrence	
(Bodily Injury and Property Damage)	\$1,000,000

3. Automobile Liability:

Bodily Injury:	
Each person	\$1,000,000
Each accident	\$1,000,000
Property Damage:	
Each accident	\$1,000,000

4. Excess or Umbrella Liability:

Per Occurrence	\$1,000,000
General Aggregate	\$1,000,000

5. Contractor's Pollution Liability:

Each Occurrence	NA
General Aggregate	NA
EJCDC® C-800, Supplementary Conditions of the Construction Contract.	

Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following: None

7. Contractor's Professional Liability:	
Each Claim	\$1,000,000
Annual Aggregate	\$1,000,000

E. Contractor shall purchase and maintain a separate Owner's Protective Liability policy, issued to Owner at the expense of Contractor, including Owner and Engineer as named insureds. This insurance shall provide coverage for not less than the following amounts:

Bodily Injury	\$5,000,000 Each Occurrence
	\$5,000,000 Aggregate
Property Damage	\$5,000,000 Each Occurrence
	\$5,000,000 Aggregate

- 1. Insurance coverage for the Contractor's Comprehensive General and Excess Liability policies and for the Owner's Protective Liability policy shall be written by one and the same insurance company to avoid the expense of duplicate and/or overlapping coverage and to facilitate and expedite the settlement of claims.
- 2. The Owner's Protective Liability policy shall protect from claims which may arise from operations under the Contract, including operations performed for a named insured by independent contractors and general inspection or monitoring by a named insured. The policy also shall protect against Automobile Non-Ownership Liability in connection with the Contractor's operations under the Contract, whether such operations be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.
- SC-6.04 Add the following new subparagraph after subparagraph 6.04.A:

6.04.A.1 In addition to Owner, Contractor, and all Subcontractors, include as insureds the following:

a. Mott MacDonald (134 Capital Drive, Suite D, West Springfield, MA 01089)

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

- SC-7.03 Add the following new paragraph immediately after Paragraph 7.03.C:
 - D. Whenever Owner shall notify Contractor in writing that any person on the Work appears to be incompetent, disorderly, or otherwise unsatisfactory, such person

shall be removed from the Project and shall not again be employed on it except with the consent of Owner.

- SC-7.04 Add the following new subparagraph immediately after Paragraph 7.04.C:
 - D. Whenever it is written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide an "Efficiency Guarantee Bond" or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure
- SC-7.05 Add the following new subparagraph immediately after Paragraph 7.05.A.1.b:

c. Where the name of an item, material or manufacturer is mentioned in the Specifications or on the Drawings, except as above noted, the intent is to establish a standard and in no way should be construed to exclude any item or manufacturer not mentioned by name, but whose product meets the Specifications as to design, utility and quality. Final decision shall rest with the Owner and Engineer as to its acceptability.

SC-7.07 Add the following new subparagraph immediately after Paragraph 7.07.M:

N. Contractor shall make payments to Subcontractors in accordance with Massachusetts General Law Chapter 30, Section 39F.

- SC-7.09 Delete the word "Owner" in the last sentence of Paragraph 7.09.A and replace with the word "Contractor".
- SC-7.09 Add the following new subparagraph immediately after Paragraph 7.09.A:

7.09.B. The Owner has obtained the following permits and approvals for the Project. The Contractor is required to comply with the permit provisions. Copies of the permits are appended to this section.

- West Springfield Conservation Commission Order of Conditions
- Massachusetts Historical Commission Project Notification Form MA State Historic Preservation Office
- SC-7.10 Add a new paragraph immediately after Paragraph 7.10.A:

B. Owner is exempt from payment of sales and compensating use taxes of the Commonwealth of Massachusetts and of cities and counties thereof on all materials to be incorporated into the Work.

- 1. Owner will furnish the required tax exemption number to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.
- 2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.
- SC-7.11 Add the following new paragraph immediately after paragraph 7.11.C.

D. Contractor shall comply with all applicable provisions of Chapter 30, Section 39R of the Massachusetts General Laws regarding Contractor's records.

SC-7.18 Add the following new paragraph immediately after paragraph 7.18.B.

C. If, through acts of neglect on the part of Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the Work, Contractor shall settle with

such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractor will so settle. If such other Contractor or Subcontractor shall assert any claim against Owner on account of any such damage alleged to have been sustained, Owner shall notify Contractor, who shall indemnify, defend, and save harmless Owner against any such claim.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

- 1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.
- 2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.
- 3. Liaison
 - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.
- 4. Review of Work; Defective Work
 - a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Observe whether any Work in place appears to be defective.
 - c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.
- 5. Inspections and Tests
 - a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.
 - b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.
- 6. *Payment Requests:* Review Applications for Payment with Contractor.
- 7. Completion

- a. Participate in Engineer's visits regarding Substantial Completion.
- b. Assist in the preparation of a punch list of items to be completed or corrected.
- c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.
- d. Observe whether items on the final punch list have been completed or corrected.
- D. The RPR will not:
- 1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
- 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
- 3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
- 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.
- 5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
- 6. Participate in specialized field or laboratory tests or inspections conducted offsite by others except as specifically authorized by Engineer.
- 7. Authorize Owner to occupy the Project in whole or in part.
- 8. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

ARTICLE 11 - CHANGES TO THE CONTRACT

SC-11.03 Amend the first sentence of paragraph 11.03.B.1 by replacing "30 days" with "15 days".

Amend the first sentence of paragraph 11.03.B.2 by replacing "60 days" with "30 days".

SC-11.07 Delete paragraph 11.07.C.2.c in its entirety and insert the following in its place:

c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the Cost of the Work, <u>not</u> including any Subcontractor's fee; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

SC-11.09 Insert the following sentence at the end of Paragraph 11.06.A.2:

If Engineer does not take action on the Change Proposal and neither Owner nor Contractor submit a letter to the other party indicating that the Change Proposal is deemed denied, then the Change Proposal shall be deemed denied after 60 days of Engineer's receipt of the Contractor's supporting data, thereby commencing the time for appeal of the denial under Article 12.

ARTICLE 13 - COST OF WORK; ALLOWANCES, UNIT PRICE WORK

SC-13.01 Supplement Paragraph 13.01.B.5.c.(2) by adding the following sentences:

The equipment rental rate book that governs the included costs for the rental of machinery and equipment owned by Contractor (or a related entity) under the Cost of the Work provisions of this Contract is the most current edition of "Rental Rate Bluebook for Construction Equipment" (the "Bluebook"), published by Equipment Watch (equipmentwatch.com), or a similar publication approved by Engineer and adjusted for regional and age adjustments as specified in the "Bluebook." Rental periods corresponding to the overall period of use shall be used, except if a piece of equipment used on extra work is already on the job, or has previously been rented for a long period of time (months), then the long-term rental rate (monthly) shall be used in determining costs. The hourly rental rate for long-term rental equipment will be determined by the monthly rental rate divided by 176.

For the situation where equipment is on the job and available for use but cannot be used due to a delay or suspension of a portion or all of the Contract activities, a rental standby rate may be paid if the Contractor can conclusively demonstrate to the satisfaction of the Engineer that: (1) the equipment cannot be used elsewhere on the Project or demobilized and remobilized at a cost lower than the cost of standby time, (2) that the equipment cannot be put in use due to factors beyond the Contractor's control, and (3) the equipment on standby would have been used as part of the Work that is suspended or put on hold. The standby rate will be calculated as no more than 50% of the rental rate as listed in the "Bluebook" and adjusted for regional and age adjustments. Lesser standby rates may apply if the Owner or Engineer can demonstrate that the Contractor's standby cost is less than this rate. The standby rate will not include operating costs. A standby rate will not be paid for equipment which is being employed for portions of the Work which are still underway. A standby rate will also not be paid for equipment which is readily demobilized including construction equipment categorized as "shop tools" or "miscellaneous" in the "Bluebook." Standby rates for durations of less than four hours will not be considered.

Add the following new paragraph immediately after Paragraph C.1.7:

8. Costs of or rental of small tools; costs of or rental of buildings.

SC-13.03 Unit Price Work

SC-13.03 Delete Paragraph 13.030.B in its entirety and replace it with the following:

B. Since subject to change upon determination of actual quantities, estimated quantities of items of Unit Price Work are not guaranteed and serve to facilitate comparison of Bids and to determine an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

ARTICLE 14 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCCEPTANCE OF DEFECTIVE WORK

- SC-14.02 Insert after the word "notice" the words "(minimum 24 hours)" in paragraph 14.02.A.
- SC-14.03 Delete paragraph 14.03B in its entirety and replace with the following:

14.03B Engineer's Authority: At any time during the progress of the Work, Engineer shall have the authority to determine whether Work is defective, and reject defective Work, even though such work has been previously inspected and paid for.

SC-14.06 Add the following new paragraph immediately after paragraph 14.06A:

B. If Owner stops work under Paragraph 14.06, Contractor shall not be entitled to an extension of Contract Time nor to an increase in Contract Price.

ARTICLE 15 - PAYMENTS TO CONTRACTOR, SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01 Delete the first sentence of paragraph 15.01.A.1 and replace with the following:

Engineer will, once in each month, make an estimate in writing of the total value of the work completed as of the date of the Application. Engineer shall review the Application with Contractor, and Contractor shall sign the Application.

SC-15.01 Insert the following sentence at the end of paragraph 15.01.B.2:

The Certificate of Insurance for stored materials must list Mott MacDonald and the Town of West Springfield as additional insureds.

SC-15.01 Delete paragraph 15.01.C.1 in its entirety and insert the following in its place:

Progress Payments will be made in accordance with Massachusetts General Law Chapter 30, Section 39G, which is referenced in Part II of these Supplementary Conditions.

SC-15.01 Delete paragraph 15.01.D.1 in its entirety and insert the following in its place:

Progress Payments will be made in accordance with Massachusetts General Law Chapter 30, Section 39G, which is referenced in Part II of these Supplementary Conditions.

- SC-15.03 Delete the second sentence in Paragraph 15.03.A in its entirety.
- SC-15.03 Add the following new paragraph immediately after paragraph 15.03.A:

15.03A.1 Substantial Completion shall be as defined in Chapter 30, Section 39G of the Massachusetts General Laws.

SC-15.03 Delete paragraph 15.03.C in its entirety and insert the following in its place:

If, after consultation with Owner, Engineer considers and the Owner agrees that the Work is substantially complete, Engineer will prepare and deliver to Contractor, in a form approved by Owner, a Certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be included with the certificate a list of items to be completed or corrected before final payment.

SC-15.03 Delete the word "preliminary" from paragraph 15.03D.

SC-15.03 Add the following new paragraph immediately after paragraph 15.03F:

15.03G. The procedure for Substantial Completion shall be in accordance with Chapter 30, Section 39G of the Massachusetts General Laws.

SC-15.04 Add the following new paragraph immediately after paragraph 15.04A.3:

15.04A.4 Owner may at any time request Contractor in writing to permit Owner to take over operation of any part of the Work although it is not substantially complete. A copy of such request will be sent to Engineer, and within a reasonable time thereafter Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If Contractor does not object in writing to Owner and Engineer that such part of the Work is not ready for separate operation by Owner, Engineer will finalize the list of items to be completed or corrected and will deliver such lists to Owner and Contractor together with a written recommendation as to the division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance, utilities, insurance, warranties, and guarantees for that part of the Work which will become binding upon Owner and Contractor at the time when Owner takes over such operation (unless they shall have otherwise agreed in writing and so informed Engineer). During such operation and prior to Substantial Completion of such part of the Work, Owner shall allow Contractor reasonable access to complete or correct items on said list and to complete other related Work.

Paragraph 15.04.A.4 shall be renumbered to 15.04.A.5

SC-15.06 Delete paragraph 15.06.D in its entirety and insert the following in its place:

D. Payment Becomes Due: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, or other time period in accordance with applicable laws and regulations, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

- SC-16.01 Delete paragraph 16.01.A in its entirety and insert the following in its place:
 16.01.A Owner may order, at any time and without cause, suspension of the Work in accordance with Massachusetts General Law Chapter 30, Section 390, which is referenced in Part II of the Supplementary Conditions.
- SC-16.02 Add the following new paragraph immediately after paragraph 16.02.A.4:

16.02.A.5 If Contractor abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of Owner, or if the Contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified.
ARTICLE 18 - MISCELLANEOUS

SC-18.10 Add the following new paragraphs immediately after paragraph 18.10.

18.11 Wage Rates

- A. The requirements and provisions of all applicable laws and any amendments thereof or additions thereto as to the employment of labor, and to the schedule of minimum wage rates established in compliance with laws shall be a part of these Contract Documents. Copies of the wage schedules are included in Part II of these Supplementary Conditions. If it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the officials administrating the laws mentioned above. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation.
- B. The schedules of wages referred to above are minimum rates only, and Owner will not consider any claims for additional compensation made by Contractor because of payment by Contractor of any wage rate in excess of the applicable rate contained in these Contract Documents. All disputes in regard to the payment of wages in excess of those specified in the schedules shall be resolved by Contractor.
- C. Per MGL Chapter 149, Section 27, Contractor shall comply with annual updates to the prevailing wage schedule which shall be effective on the anniversary date of the execution of the Contract.
- D. The said schedules of wages shall continue to be the minimum rates to be paid during the life of this Agreement and a legible copy of said schedules shall be kept posted in a conspicuous place at the site of the work.
- E. Both Federal and State schedules of minimum wage rates are included in Part II of these Supplementary Conditions. Where rates differ, the higher rates shall apply as a minimum for that trade.

18.12 American Iron and Steel

The Contractor acknowledges to and for the benefit of the Owner and the Commonwealth of Massachusetts (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information

necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State. Notwithstanding any other provisions of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Owner). While the Contractor has no direct contractual privity with the State, as a lender to the Owner for the funding of its project, the Owner and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State. Refer to Attachment I of this Section for further information on documenting compliance with the American Iron and Steel requirement.

PART II – FEDERAL AND STATE GOVERNMENT PROVISIONS

Federal and State Government Provisions referenced or included herein, have been selected from those to which specific references have been made elsewhere in the Contract Documents. Each and every other provision of law or clause required by law to be inserted in this Contract shall be deemed to be also inserted herein in accordance with paragraph 3.01.H of the Supplementary Conditions.

1.0 FEDERAL GOVERNMENT PROVISIONS

- 1.1 David Bacon Act Requirements
- 1.2 Labor Standards Provisions for Federal and Federally Assisted Contracts
- 1.3 Federal Wage Rates
- 1.4 American Iron and Steel (AIS) Requirement

2.0 COMMONWEALTH OF MASSACHUSETTS PROVISIONS

- 2.1 The Owner and Contractor agree that the following Commonwealth of Massachusetts Provisions apply to the work to be performed under this Contract and that these provisions supersede any conflicting provisions of this Contract.
- 2.2 Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Code of Federal Regulations and State Laws and Regulations exist, the more stringent requirements shall apply.
- 2.3 This project is subject to the Safety and Health Regulations of the U.S. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety 'Rules and Regulations for the Prevention of Accidents in Construction Operations' (Chapter 454 CMR 10.00 et seq.). Contractors shall be familiar with the requirements of these regulations.
- 2.4 Massachusetts General Laws
 - 2.4.1 Chapter 30, Section 39F

2.4.2 Chapter 30, Section 39G

- 2.4.3 Chapter 30, Section 39I
- 2.4.4 Chapter 30, Section 39J
- 2.4.5 Chapter 30, Section 39K
- 2.4.6 Chapter 30, Section 39L
- 2.4.7 Chapter 30, Section 39M
- 2.4.8 Chapter 30, Section 39N
- 2.4.9 Chapter 30, Section 390
- 2.4.10 Chapter 30, Section39P
- 2.4.11 Chapter 30, Section 39Q
- 2.4.12 Chapter 30, Section 39R
- 2.4.13 Chapter 44, Section 31C
- 2.4.14 Chapter 82, Section 40
- 2.4.15 Chapter 149, Section 34
- 2.4.16 Chapter 149, Section 44A
- 2.4.17 Chapter 149, Section 44F
- 2.4.18 Chapter 149, Section 44J
- 2.4.19 Chapter 30, Section 38A
- 2.5 520 CMR 14.00 Excavation Trench Safety
- 2.6 State Wage Rates
- 2.7 Massachusetts Construction Grants Policy Memoranda
- 2.8 The EPA requires SRF loan recipients to create and maintain a list of all MBE/WBE and non-MBE/WBE subcontractors on the project. Within 30 days of the contract award, the Contractor must submit the subcontractor list to the Owner and Engineer. A final updated subcontractor list shall be submitted with the final payment request.
- 2.9"The Construction Bid Specifications <u>SPECIAL PROVISIONS FOR</u> <u>DISADVANTAGED BUSINESS ENTERPRISES</u> The Department of Environmental Protection Division of Municipal Services" Package (EEO-DEP-SP-Page 1 through EEO-DEP-SP-Page 9 and EEO-DEP Forms).
- 2.10 Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program.

2.10.1 Contractor's Compliance Procedure

- 2.11 DWS Policy 88 02
- 2.12 Massachusetts Contingency Plan (310 CMR 40.00)
- 2.13 West Springfield Conservation Commission Order of Conditions
- 2.14 Massachusetts Historical Commission Project Notification Form MA State

Historic Preservation Office and No Adverse Effect Letter

2.15 Town of West Springfield General Conditions

END OF SECTION

ATTACHMENT A

DAVIS-BACON ACT REQUIREMENTS

APPENDIX G Davis Bacon Act Requirements

All construction projects are subject to the Davis Bacon wage rate requirements and must include the appropriate sections of the following document in its entirety in the contract documents.

The vast majority of SRF projects will be bid by Governmental Entities (i.e., Cities, Towns, Authorities, Water Districts, Wastewater Districts). These projects must include the following language in construction contracts:

I.3. Contract and Subcontract Provisions

I.4. Contract Provisions for Contracts in Excess of \$100,000 (if applicable)

I.5. Compliance Verification

This language may be found on pages DB-3-DB-11.

In certain cases, SRF projects may be bid by non-Governmental Entities (i.e., private water companies, private PWSs, etc.). These projects must include the following language in construction contracts:

II.3. Contract and Subcontract ProvisionsII.4. Contract Provisions for Contracts in Excess of \$100,000 (if applicable)II.5. Compliance Verification

This language my be found on pages DB-11-DB-21

Preamble

With respect to the Clean Water and Safe Drinking Water State revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

I. Requirements For Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Valerie Marshall at EPA Region 1 (617-918-1674) for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at https://www.dol.gov/whd/govcontracts/dbra.htm

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2012 Appropriations Act, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein:

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Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

- (ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
 - (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
 - (2) The classification is utilized in the area by the construction industry; and
 - (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at

https://www.dol.gov/whd/forms/wh347.pdf or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

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(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

- (5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
- (6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
- (7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
- (8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29

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CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.
- (3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other

Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its

assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at https://www.dol.gov/whd/whd_district_offices.pdf.

II. Requirements For Subrecipients That Are Not Governmental Entities

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a State recipient needs guidance, the recipient may contact Valerie Marshall at EPA Region 1 (617-918-1674) for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at https://www.dol.gov/whd/govcontracts/dbra.htm

Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

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(a) Subrecipients must obtain proposed wage determinations for specific localities at www.wdol.gov. After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to (insert contact information for State recipient DB point of contact for wage determination) for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official.

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov. on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(d) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(e) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2011 Full-Year Continuing Appropriation, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in (5.5(a)(4)). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

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(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the

Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification. hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is

available for this purpose from the Wage and Hour Division Web site at https://www.dol.gov/whd/forms/wh347.pdf or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
- (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
- (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of

fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved. (iii) Equal employment opportunity. The utilization of apprentices, trainees and

journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29

CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.
- (3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a). The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c). The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

DEP-DMS-G Page 20 of 21

(d). The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at https://www.dol.gov/whd/whd_district_offices.pdf.

ATTACHMENT B

DAVIS-BACON ACT WAGE RATE

"General Decision Number: MA20200010 01/03/2020

Superseded General Decision Number: MA20190010

State: Massachusetts

Construction Types: Heavy (Heavy and Marine)

Counties: Berkshire, Franklin, Hampden and Hampshire Counties in Massachusetts.

HEAVY CONSTRUCTION PROJECTS; AND MARINE CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.80 for calendar year 2020 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.80 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2020. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number Ø	Publication Date 01/03/2020	
BOIL0029-001 01/01/201	7	
	Rates	Fringes
BOILERMAKER	\$ 42.42	24.92
BRMA0001-005 02/01/201	9	
SPRINGFIELD CHAPTER		
	Rates	Fringes
BRICKLAYER BRICKLAYERS; CEMEN MASONS; STONE MASO MARBLE, TILE & TER	T ONS; RAZO\$ 41.96	29.80
BRMA0001-007 02/01/201	9	
SPRINGFIELD/PITTSFIELD BERKSHIRE COUNTY	CHAPTER	
	Rates	Fringes
BRICKLAYER BRICKLAYERS; CEMEN MASONS; STONE MAS MARBLE, TILE & TER	T ONS; RAZZO\$ 41.96	29.80
CARP0056-004 08/01/201	8	
	Rates	Fringes
DIVER TENDER DIVER	\$ 46.07 \$ 64.50	32.25 32.25
CARP0056-009 08/01/201	8	
	Rates	Fringes

PILEDRIVERMAN	\$ 46.07	32.25
CARP0108-008 09/04/2017		
BERKSHIRE		
	Rates	Fringes
CARPENTER	\$ 35.56	23.76
CARP0108-010 09/04/2017		
HAMPDEN; HAMPSHIRE; AND FRANKLIN	N (Remainde	er of County)
	Rates	Fringes
CARPENTER	\$ 35.56	23.76
* CARP0336-005 09/01/2019		
EDANKLIN COUNTY (Environ Openso		
FRANKLIN COUNTY (Erving, Orange,	, North Ora	inge, and Warwick)
FRANKLIN COUNTY (Erving, Orange,	, North Ora Rates	nge, and Warwick) Fringes
CARPENTER	, North Ora Rates \$ 41.90	nge, and Warwick) Fringes 29.00
CARPENTER CARP1121-001 10/01/2017	, North Ora Rates \$ 41.90	nge, and Warwick) Fringes 29.00
CARPENTER CARP1121-001 10/01/2017	, North Ora Rates \$ 41.90 	ringe, and Warwick) Fringes 29.00 Fringes
CARPENTER CARP1121-001 10/01/2017 MILLWRIGHT	, North Ora Rates \$ 41.90 Rates \$ 39.52	nge, and Warwick) Fringes 29.00 Fringes 30.85
CARPENTER CARP1121-001 10/01/2017 MILLWRIGHT ELEC0007-002 06/30/2019	, North Ora Rates \$ 41.90 Rates \$ 39.52	ringe, and Warwick) Fringes 29.00 Fringes 30.85
CARPENTER CARP1121-001 10/01/2017 MILLWRIGHT ELEC0007-002 06/30/2019 HAMPDEN (Except Chester & Holyok Ware)	, North Ora Rates \$ 41.90 Rates \$ 39.52 ke); HAMPSH	Inge, and Warwick) Fringes 29.00 Fringes 30.85 JIRE (Belchertown,

ELECTRICIAN.....\$ 42.66 23.68

ELEC0007-003 06/30/2019

BERKSHIRE; FRANKLIN; HAMPDEN (Chester, Holyoke); HAMPSHIRE (Except Belchertown, Ware)

	Rates	Fringes
ELECTRICIAN	.\$ 42.66	23.68
ENGI0098-007 12/01/2016		
	Rates	Fringes
Power equipment operators:		
Group 1	.\$ 33.68	23.96+A
Group 2	.\$ 33.37	23.96+A
Group 3	.\$ 33.15	23.96+A
Group 4	.\$ 32.54	23.96+A
Group 5	.\$ 29.92	23.96+A
Group 6	.\$ 28.80	23.96+A
Group 7	.\$ 26.86	23.96+A
Group 8	.\$ 305.95	23.96+A
Group 9	.\$ 230.69	23.96+A
Group 10	.\$ 35.17	23.96+A
Group 11	.\$ 38.18	23.96+A
Group 12	.\$ 39.68	23.96+A
Group 13	.\$ 40.68	23.96+A
Group 14	.\$ 41.68	23.96+A
Group 15	.\$ 43.18	23.96+A

HAZARDOUS WASTE PREMIUM \$2.00

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

Group 8 and Group 9 are per day wages.

A. Paid Holidays: New year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Shovels; crawlers and truck cranes including all tower; self-propelled hydraulic cranes 10 tons and over; draglines; clam shells; cableways; shaft hoists; mucking machines derricks; backhoes; bulldozers; gradalls; elevating graders; pile drivers; concrete pavers; trenching machines; front end loaders- 5 1/2 cu yds and over; dual drum paver; automatic grader-excavator(C.M.I. or equal); scrapers towing pan or wagon; tandem dozers or push cats(2 units in tandem); shotcrete machine; tunnel boring machine; combination backhoe/loader 3/4 cu yd hoe or over; jet engine dryer; tree shredder; post hole digger; post hole hammer; post extractor; truck mounted concrete pump with boom; roto-mill; Grader; Horizontal Drilling Machine; John Henry Rock Drill and similar equipment.

Group 2: Rotary drill with mounted compressor; compressor house (3 to 6 compressors); rock and earth boring machines (excluding McCarthy and similar drills); front end loaders 4 cu yds to 5 1/2 cu yds); forklifts-7 ft lift and over 3 ton capacity; scraper 21 yds and over (struck load); sonic hammer console; reclaimers road planer/milling machine; cal tracks; ballast regulators; rail anchor machines; switch tampers, asphalt pavers; mechanic; welder and transfer machine.

Group 3: Combination backhoe/loader up to 3/4 cu yd; scrapers up to 21 cu yd (struck load, self propelled or tractor drawn); tireman; front end loaders up to 4 yds; well drillers; engineer or fireman on high pressure boiler; self-loading batch plant; well point operators electric pumps used in well point system; pumps, 16 inches and over (total discharge); compressor, one or two 900 cu ft and over; powered grease truck; tunnel locomotives and dingys; grout pumps; hydraulic jacks; boom truck; hydraulic cranesup to 10 ton.

Group 4: Asphalt rollers; self-powered rollers and compactors; tractor without blade drawing sheepsfoot roller; rubber tire roller; vibratory roller or other type of compactors including machines for pulverizing and aerating soil; york rake.

Group 5: Hoists; conveyors; power pavement breakers; self-powered concrete pavement finishing machines; two bag mixers with skip; McCarthy and similar drills; batch plants (not self loading); bulk cement plants; self-propelled material spreaders; three or more 10 KW light plants; 30 KW or more generators; power broom.

Group 6: Compressor (one or two) 315 cu ft to 900 cu ft; pumps 4 inches to 16 inches (total discharge).

Group 7: Compressors up to 315 cu ft; small mixers with

skip; pumps up to 4 inches; power heaters; oiler; A-frame trucks; forklifts-up to 7 ft. lift and up to 3 ton capacity; hydro broom; stud welder. Group 8: Truck crane crews Group 9: Oiler Group 10: Master Mechanic Group 11: Boom lengths over 150 feet including jib Group 12: Boom lengths over 200 feet including jib Group 13: Boom lengths over 250 feet including jib Group 14: Boom lengths over 300 feet including jib Group 15: Boom lengths over 350 feet including jib IRON0007-014 03/16/2019

BERKSHIRE (Becket, East Otis, Hinsdale, Monterey, New Marlboro, North Otis, Otis, Peru, Sandisfield, Savoy, Sheffield, Washington, Windsor); FRANKLIN; HAMPDEN; HAMPSHIRE

Fringes Rates IRONWORKER.....\$ 34.20 31.20 IRON0012-003 07/01/2018 BERKSHIRE (Lee) Fringes Rates IRONWORKER.....\$ 31.00 24.43 _____ IRON0012-004 07/01/2018 BERKSHIRE (Remainder of County) Fringes Rates Ironworkers: Sheeter.....\$ 31.25 24.43 Structural, Ornamental, Reinforcing, Fence Erector, Machinery Mover,

Rigger, Rodman, Stone

Derrickman.....\$ 31.00 24.43

LAB00022-002 06/01/2018

FRANKLIN (Orange, Warwick)

	R	ates	Fringes
			U
Laborers:			
GROUP	1\$	33.25	22.92
GROUP	2\$	33.50	22.92
GROUP	3\$	34.00	22.92
GROUP	4\$	34.25	22.92
GROUP	5\$	34.00	22.92
GROUP	6\$	34.25	22.92

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders, plasterer tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tenmder; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drill operatorm jackhammer operator, pavement breaker, carbide core drilling machine, chain saw operator, barco type jumping tampers, concrete pump, motorized mortar miner, ride-on motorized buggy

GROUP 3: Air track operator; block paver; rammer; curb setter, hydraulic and similar self-powered drills

GROUP 4: Blaster; powderman

GROUP 5: Precast floor and roof, plank erector

GROUP 6: Asbestos Abatement, Toxic and Hazardous waste laborers

LAB00473-005 06/01/2018

FRANKLIN (Except Orange and Warrick); HAMPDEN and HAMPSHIRE COUNTIES (with the exception of Chesterfield, Cummington, Goshen, Middlefield, Plainfield, and Worthington)

	F	Rates	Fringes
Laborers:			
Group	1\$	31.00	20.18
Group	2\$	31.25	20.18
Group	3\$	31.75	20.18
Group	4\$	32.00	20.18
Group	5\$	21.50	20.18
Group	6\$	31.00	20.18

LABORERS CLASSIFICATIONS

Group 1: Carpenter tenders, cement finisher tenders, laborers, wrecking laborers

Group 2: Asphalt rakers, fence and guard rail erectors, laser beam operator, mason tender, pipelayer, pneumatic drill operator, pneumatic tool operator, wagon drill operator

Group 3: Air track operator, block pavers, rammers, curb setters

Group 4: Blasters, powdermen

Group 5: Flaggers

Group 6: Asbestos abatement, toxic and Hazardous waste laborers

LAB00473-006 06/01/2018

BERKSHIRE; HAMPSHIRE COUNTIES (the towns of Chesterfield, Cummington, Goshen, Middlefield, Plainfield, and Worthington only)

	Rates	s Fringes
Laborers:		
Group	1\$ 27.5	58 22.29
Group	2\$ 27.8	33 22.29
Group	3\$ 28.3	33 22.29
Group	4\$ 28.5	58 22.29
Group	5\$ 21.5	50 22.29
Group	6\$ 28.5	58 22.29

LABORERS CLASSIFICATIONS

Group 1: Carpenter tenders, cement finisher tenders, laborers, wrecking laborers

Group 2: Asphalt rakers, fence and guard rail erectors, laser beam operator, mason tender, pipelayer, pneumatic drill operator, pneumatic tool operator, wagon drill operator

Group 3: Air track operator, block pavers, rammers, curb setters

Group 4: Blasters, powdermen

Group 5: Flaggers

Group 6: Asbestos abatement, toxic and Hazardous waste laborers

LAB01421-002 06/01/2018

	F	Rates	Fringes
Laborers:			
Group	1\$	38.15	24.10
Group	2\$	38.90	24.10
Group	3\$	39.15	24.10
Group	4\$	34.15	24.10
Group	5\$	37.25	24.10
Group	6\$	38.15	24.10
Group 1: Adzeman, Wrecking Laborer. Group 2: Burners, Jackhammers. Group 3: Small Backhoes, Loaders on tracks, Bobcat Type Loaders, Hydraulic ""Brock"" Type Hammer Operators, Concrete Cutting Saws. Group 4: Yardman (Salvage Yard Only). Group 5: Yardman, Burners, Sawyers. Group 6: Asbestos, Lead Paint, Toxic and Hazardous Waste. PAIN0035-010 07/01/2019 Fringes Rates PAINTER NEW CONSTRUCTION: Brush, Taper.....\$ 32.33 26.35 Spray, Sandblast.....\$ 34.03 27.00 **REPAINT:** Bridge.....\$ 50.66 27.00 Brush, Taper.....\$ 29.65 26.35 Spray, Sandblast.....\$ 31.35 27.00 -----PLUM0004-003 09/01/2019

FRANKLIN (Orange)

	Rates	Fringes
Plumber and Steamfitter	.\$ 45.41	26.56
* PLUM0104-004 09/17/2019		

BERKSHIRE (Becket, Otis, Sandisfield); FRANKLIN (Except Monroe, Rowe, and the Western part of Charlemont); HAMPDEN; HAMPSHIRE

		F	Rates	Fringes
Plumbers	and	Pipefitters\$	41.21	25.90

FOOTNOTE:

A. Two paid holidays, Independence Day and Labor Day,

provided the employee has been employed seven days prior to the holiday by the same employer

* PLUM0104-009 09/17/2019

BERKSHIRE (Except Otis, Becket, Sandisfield); FRANKLIN (Monroe, Rowe and the Western part of Charlemont)

Rates Fringes

Plumber and Steamfitter.....\$ 41.21 25.90+a

FOOTNOTE FOR PLUMBERS & STEAMFITTERS:

A. Paid holidays: Independence Day and Labor Day, provided the employee has been employed seven days prior to the holiday by the same employer.

TEAM0379-001 06/01/2019

	Rates	Fringes
Truck drivers:		
Group 1	\$ 34.08	25.1125+A+B
Group 2	\$ 34.25	25.1125+A+B
Group 3	\$ 34.32	25.1125+A+B
Group 4	\$ 34.44	25.1125+A+B
Group 5	\$ 34.54	25.1125+A+B
Group 6	\$ 34.83	25.1125+A+B
Group 7	\$ 35.12	25.1125+A+B

POWER TRUCKS \$.25 DIFFERENTIAL BY AXLE

TUNNEL WORK (UNDERGROUND ONLY) \$.40 DIFFERENTIAL BY AXLE HAZARDOUS MATERIALS (IN HOT ZONE ONLY) \$2.00 PREMIUM

TRUCK DRIVERS CLASSIFICATIONS

Group 1: Station wagons; panel trucks; and pickup trucks

Group 2: Two axle equipment; & forklift operator

Group 3: Three axle equipment and tireman

Group 4: Four and Five Axle equipment

Group 5: Specialized earth moving equipment under 35 tons other than conventional type trucks; low bed; vachual; mechanics, paving restoration equipment

Group 6: Specialized earth moving equipment over 35 tons

Group 7: Trailers for earth moving equipment (double hookup)

FOOTNOTES:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day

B. PAID VACATION: Employees with 4 months to 1 year of service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 - 10 years of service; and 3 weeks vacation for more than 10 years of service

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

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

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014. Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage

payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

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ATTACHMENT C

AMERICAN IRON AND STEEL REQUIREMENTS

APPENDIX I

AMERICAN IRON AND STEET REQUIREMENTS

S	WASHINGTON, D.C. 20450
^a l _F an	MAR 2 0 2014
	4 = 0-
MEMORAN	DUM
SI 13.07CT)	Implementation of American from and Steel provisions of P.1 113-76, Consolidated Appropriations Act, 2014
from ţ <i>i</i>	Andrew D. Sawyers, Director Office of Wastewater Management (4201M) Peter C. Grevall Director
10;	Water Management Division Directors

P.L. 113-76. Consolidated Appropriations Act, 2014 (Act), includes an "American Irion and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use from and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Veat 2014.

Section 436 also acts forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014

The approach described below explains how FPA with implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be grained.

Prese Advance (III), the constraints of the constra

Implementation

The Act states:

Sec. 436 (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the "Administrator") finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section. (f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

Covered Iron and Steel Products

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings; Manhole Covers; Municipal Castings (defined in more detail below); Hydrants; Tanks; Flanges; Pipe clamps and restraints; Valves; Structural steel (defined in more detail below); Reinforced precast concrete; and Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches; Ballast Screen; Benches (Iron or Steel); Bollards; Cast Bases: Cast Iron Hinged Hatches, Square and Rectangular; Cast Iron Riser Rings; Catch Basin Inlet; Cleanout/Monument Boxes: Construction Covers and Frames; Curb and Corner Guards; Curb Openings: Detectable Warning Plates; Downspout Shoes (Boot, Inlet); Drainage Grates, Frames and Curb Inlets; Inlets: Junction Boxes; Lampposts: Manhole Covers, Rings and Frames, Risers; Meter Boxes: Service Boxes; Steel Hinged Hatches, Square and Rectangular; Steel Riser Rings; Trash receptacles; Tree Grates;

Tree Guards; Trench Grates; and Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer, processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://oig.hhs.gov/fraud/report-fraud/

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

<u>Reasonably Available Quantity</u>: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

<u>Satisfactory Quality</u>: The quality of iron or steel products, as specified in the project plans and designs.

<u>Assistance Recipient</u>: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

- 1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
- 2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
- 3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver. If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General		
Waiver request includes the following information:		
 Description of the foreign and domestic construction materials 		
— Unit of measure		
— Quantity		
— Price		
— Time of delivery or availability		
 Location of the construction project 		
 Name and address of the proposed supplier 		
 A detailed justification for the use of foreign construction materials 		
 Waiver request was submitted according to the instructions in the memorandum 		
• Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language		
in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests		
Waiver request includes the following information:		
 Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron 		
and steel products		
 Relevant excerpts from the bid documents used by the contractors to complete the comparison 		
— Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description		
of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests		
 Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or 		
quality of the materials for which the waiver is requested:		
 Supplier information or pricing information from a reasonable number of domestic suppliers indicating 		
availability/delivery date for construction materials		
 Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the 		
process for identifying suppliers and a list of contacted suppliers.		
 Project schedule 		
 Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of 		
construction materials		
• Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic		
construction materials for which the waiver is sought		
 Has the State received other waiver requests for the materials described in this waiver request, for comparable projects? 		

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

- 1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
- 2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests				
• Does the waiver request include the following information?				
 Comparison of overall cost of project with domestic iron and steel products to overall cost of project with 				
foreign iron and steel products				
 Relevant excerpts from the bid documents used by the contractors to complete the comparison 				
 A sufficient number of bid documents or pricing information from domestic sources to constitute a 				
reasonable survey of the market				
Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests				
• Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or				
quality of the iron and/or steel product for which the waiver is requested?				
 Supplier information or other documentation indicating availability/delivery date for materials 				
— Project schedule				
 Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality 				
of materials				
• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate				
domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted				
suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be				
unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic				
delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is				
requested?				
Examples include:				
— Multiple waiver requests for the materials described in this waiver request, for comparable projects in the				
same State				
— Multiple waiver requests for the materials described in this waiver request, for comparable projects in other				
States				
— Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required				
by the project plans, specifications, and/or permits?				

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel Requirement") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions. ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____("Purchaser") and (the "State") that it understands the goods and services under this the Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

The following information is provided as a sample letter of step certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

- 1. Xxxx
- 2. Xxxx
- 3. Xxxx

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

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The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

- 1. Xxxx
- 2. Xxxx
- 3. Xxxx

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

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ATTACHMENT D

MASSACHUSETTS GENERAL LAW STATUTES

Part I	ADMINISTRATION OF THE GOVERNMENT
Title III	LAWS RELATING TO STATE OFFICERS
Chapter 30	GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES
Section 38A	PRICE ADJUSTMENT CLAUSE IN CONTRACTS FOR ROAD, BRIDGE, WATER AND SEWER PROJECTS AWARDED UNDER SEC. 39M

Section 38A. Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent.

Part I	ADMINISTRATION OF THE GOVERNMENT
Title III	LAWS RELATING TO STATE OFFICERS
Chapter 30	GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES
Section 39F	CONSTRUCTION CONTRACTS; ASSIGNMENT AND SUBROGATION; SUBCONTRACTOR DEFINED; ENFORCEMENT OF CLAIM FOR DIRECT PAYMENT; DEPOSIT, REDUCTION OF DISPUTED AMOUNTS

Section 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 interestbearing 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 subbid 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, (iii) 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.

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Section 39G	COMPLETION OF PUBLIC WORKS; SEMI-FINAL AND FINAL ESTIMATES; PAYMENTS; EXTRA WORK; DISPUTED ITEMS

Section 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 complete 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
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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.

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Chapter 30	GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES
Section 39I	DEVIATIONS FROM PLANS AND SPECIFICATIONS

Section 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.

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Section 39J	PUBLIC CONSTRUCTION CONTRACTS; EFFECT OF DECISIONS OF CONTRACTING BODY OR ADMINISTRATIVE BOARD

Section 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.

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Chapter 30	GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES
Section 39K	PUBLIC BUILDING CONSTRUCTION CONTRACTS; PAYMENTS

Section 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

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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

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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.

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Section 39L	PUBLIC CONSTRUCTION WORK BY FOREIGN CORPORATIONS; RESTRICTIONS AND REPORTS

Section 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.

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Chapter 30	GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES
Section 39M	CONTRACTS FOR CONSTRUCTION AND MATERIALS; MANNER OF AWARDING

Section 39M. (a) Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district or housing authority that is and estimated by the awarding authority to cost less than \$10,000 dollars shall be obtained through the exercise of sound business practices as defined in section 2 of chapter 30B. The awarding authority shall make and keep a record of each procurement that, at a minimum, shall include the name and address of the person from whom the services were procured. An awarding authority that utilizes a vendor on a statewide contract procured through the operational services division, or a blanket contract procured by the awarding authority pursuant to this section, shall be deemed to have obtained the contract through sound business practices.

Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district or housing authority that is estimated by the awarding authority to cost not less than \$10,000 but not more than \$50,000 shall be awarded to the responsible bidder offering to perform the contract at the lowest price. The awarding authority shall make public notification of the contract and shall seek written responses from no fewer than 3 persons who customarily perform such work. For purposes of this subsection, the term "public notification" shall include, but need not be limited to, posting, at least 2 weeks before the time specified in the notification for the receipt of responses, the contract and scope-of-work statement: (1) on the website of the awarding authority, (2) on the COMMBUYS system administered by the operational services division, (3) in the central register published pursuant to section 20A of chapter 9 and (4) in a conspicuous place in or near the primary office of the awarding authority; provided, however, that if the awarding authority obtains a minimum of 2 written responses from a vendor list established through a blanket contract or a statewide contract procured through the operational services division, and the lowest of those written responses is deemed acceptable to the awarding authority, public notification is not required. The solicitation shall include a scope-of-work statement that defines the work to be performed and provides potential responders with sufficient information regarding the

objectives and requirements of the awarding authority and the time period within which the work shall be completed. The awarding authority shall record the names and addresses of all persons from whom written responses were sought, the names of the persons submitting written responses and the date and amount of each written response.

An awarding authority may utilize a vendor list established through a statewide contract procured through the operational services division to identify 1 or more of the persons from whom it will seek written responses for purposes of this subsection. An awarding authority may also procure a blanket contract to establish a listing of vendors in certain defined categories of work that are under contract to provide services for multiple individual tasks of not more than \$50,000 each, and from whom written responses will be sought. Any such blanket contract procured by the awarding authority shall be procured pursuant to this section or sections 44A to 44J, inclusive, of chapter 149 which are applicable to projects over \$50,000.

Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district or housing authority that is estimated by the awarding authority to cost more than \$50,000, and every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, as defined by subsection (1) of section 44A of chapter 149, estimated to cost more than \$50,000 but not more than \$150,000, shall be awarded to the lowest eligible responsible bidder on the basis of competitive bids publicly opened and read by the awarding authority forthwith upon expiration of the time for the filing thereof; provided, however, that such awarding authority may reject any and all bids, if it is in the public interest to do so. Every bid for such contract shall be accompanied by a bid deposit in the form of: (1) a bid bond, (2) cash, or (3) a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to the awarding authority. The amount of the bid deposit shall be 5 per cent of the value of the bid. Any person submitting a bid pursuant to this section shall, on such bid, certify as follows:

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.

(Name of person signing bid)

(Company)

This subsection shall not apply to the award of any contract subject to the provisions of sections 44A to 44J, inclusive, of chapter 149 and every such contract shall continue to be awarded as provided therein. In cases of extreme emergency: (1) caused by enemy attack, sabotage or other such hostile actions or (2) resulting from an imminent security threat explosion, fire, flood, earthquake, hurricane, tornado or other such catastrophe, an awarding authority may, without competitive bids and notwithstanding any general or special law, award contracts otherwise subject to this subsection to

perform work and to purchase or rent materials and equipment, all as may be necessary for temporary repair and restoration to service of any and all public work in order to preserve the health and safety of persons or property; provided, that this exception shall not apply to any permanent reconstruction, alteration, remodeling or repair of any public work.

(b) Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in writing by the awarding authority to anyone making a written request therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said name or described materials.

(c) The term "lowest responsible and eligible bidder" shall mean 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 United States Occupational Safety and Health Administration that is at least 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 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; provided further, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable.

(d) The provisions of this section shall not apply (1) to the extent that they prevent the approval of such specifications by any contributing federal agency, (2) to materials purchased under specifications of the state department of highways at prices established by the said department pursuant to

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advertisement and bidding in connection with work to be performed under the provisions of chapter eighty-one or chapter ninety, (3) to any transaction between the commonwealth and any of its political subdivisions or between the commonwealth and any public service corporation, and (4) to any contract of not more than \$50,000 awarded by a governmental body, as defined by section two of chapter thirty B, in accordance with the provisions of section five of said chapter thirty B; and (5) to any contract solely for the purchase of material awarded by a governmental body, as defined by section by section 2 of chapter 30B, in accordance with section 5 of said chapter 30B, or procured through the operational services division pursuant to sections 22 and 52 of chapter 7.

(e) The word "material" as used in this section shall mean and include any article, assembly, system, or any component part thereof.

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Section 39M1/2	PROJECT OVERSIGHT; OWNER'S REPRESENTATIVE; QUALIFICATIONS; PROCUREMENT; POWERS AND DUTIES

Section 39M1/2. (a) The following words shall have the following meanings unless the context clearly requires otherwise:

"Certified estimate of cost", a good-faith estimate based on the best available information and made by the most senior official in the agency responsible for the contract, accounting for all expenses which could be reasonably foreseen including, but not limited to, those involving design, construction, management, acquisition and disposition of rights of way and contingency costs.

"Cost-plus basis", a form of compensation in which a premium is added to the actual cost of service to determine a total amount to be paid.

"Major contract", a contract by which the commonwealth or any of its public agencies or authorities is to procure the construction, repair or rehabilitation of a publicly-owned highway, railway, bridge, tunnel, building platform or any component thereof and for which the certified estimate of cost exceeds \$50,000,000, or a contract or lease by which the commonwealth or any of its public agencies or authorities is to procure, directly or indirectly, the construction, repair or rehabilitation of a privately-owned, publicly-used highway, railway, bridge, tunnel, building platform or any component thereof.

"Oversight cost estimate", an estimate developed by the commonwealth or any agency thereof, prior to the engagement of an owner's representative, of the anticipated total cost of the services of that representative. "Owner's representative", an individual registered by the commonwealth as a professional engineer, who has not less than 5 years of experience in the construction and supervision of construction of the type which is the subject of the pertinent major contract in nature, scope and complexity.

"Owner's representative" shall mean an individual registered by the commonwealth as a professional engineer, who has not less than 5 years of experience in the construction and supervision of construction of the type which is the subject of the pertinent major contract in nature, scope and complexity.

(b) The commonwealth or any agency or authority thereof shall engage and maintain an owner's representative to provide professional project oversight with regard to any major contract. Such representative shall be an individual employed by a corporation, partnership, sole proprietorship, joint stock company, joint venture or other entity engaged in the practice of providing project management services for public construction of the nature, scope and complexity which is the subject of the contract. A public agency may designate an existing employee as owner's representative subject to the conditions set forth in subsection (c).

(c) An existing employee of a public agency may act as its owner's representative if the following conditions are met:

(1) the employee meets or exceeds the qualifications set forth in subsection (b);

(2) the employee has suitable experience in the construction and supervision of projects of the nature, scope and complexity of the relevant major contract; and

(3) The employee and his employer have entered into a memorandum of understanding, contract or other comparable document establishing the independence of the employee as being equal to that of an owner's representative contracted from the private sector;

(d) An owner's representative shall certify in writing, under the pains and penalties of perjury, that his sole responsibility shall be to the commonwealth and the agency which has retained his services. The independent owner's representative shall be wholly independent of the designer, general contractor or any subcontractor involved in the public works project and shall attest to the same in a sworn statement.

(e) An owner's representative shall be subject to chapter 268A.

(f) An owner's representative shall be selected and retained prior to the award of a major contract by any public agency; provided, however, that such agency shall select and procure the services of the owner's representative through a process which is documented in writing, incorporates the evaluation of qualifications and experience and is competitive in nature. The process shall utilize a system of written applications which shall be retained for inspection for a period of not less than 6 months following the selection of an owner's representative. The process shall also be promulgated in writing by the inspector general prior to the commencement of any hiring process pursuant to this section.

(g) Any major contract executed prior to the selection of an owner's representative shall be null and void as against public policy. Prior to the award of any major contract, the public agency seeking to award the contract shall certify in writing to the inspector general that an owner's representative has been selected.

(h) Any individual, organization or agency eligible to receive information from an owner's representative shall do so in a form and manner approved and promulgated by the inspector general. Upon receipt of such request, the owner's representative shall respond within 60 days. Such response shall contain the requested information, indicate why it is not available to the party requesting it or

indicate a date certain when the information will be available and the date on which it will be provided. A party denied information pursuant to this section may appeal such denial to the inspector general.

(i) The owner's representative shall conduct a peer review of engineering elements on its projects.

(j) The owner's representative shall be the primary manager of cost recovery and value engineering on the project.

(k) The owner's representative shall enjoy unfettered access to project work sites, documents, and correspondence.

(1) The owner's representative shall file reports on the project, under oath, not later than December 31 of each year in which their contract is in effect, to the inspector general, to the secretary of transportation and public works, the house and senate chairs of the joint committee on transportation and to the state auditor.

(m) The inspector general shall promulgate regulations governing the operations and actions of owner's representatives which shall include, but not be limited to, sanctions for misfeasance, malfeasance and the failure to adhere to any contracts or agreements executed pursuant to this section.

(n) In no instance shall an awarding agency execute a contract that pays the independent owner's representative on a cost-plus basis. Awarding agencies shall establish an oversight cost estimate for the work of an owner's representative prior to the hiring of the owner's representative.

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Section 39N	CONSTRUCTION CONTRACTS; EQUITABLE ADJUSTMENT IN CONTRACT PRICE FOR DIFFERING SUBSURFACE OR LATENT PHYSICAL CONDITIONS

Section 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.

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Section 39O	CONTRACTS FOR CONSTRUCTION AND MATERIALS; SUSPENSION, DELAY OR INTERRUPTION DUE TO ORDER OF AWARDING AUTHORITY; ADJUSTMENT IN CONTRACT PRICE; WRITTEN CLAIM

Section 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.

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Section 39P	CONTRACTS FOR CONSTRUCTION AND MATERIALS; AWARDING AUTHORITY'S DECISIONS ON INTERPRETATION OF SPECIFICATIONS, ETC.; TIME LIMIT; NOTICE

Section 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.

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Section 39Q	CONTRACTS FOR CAPITAL FACILITY CONSTRUCTION; CONTENTS; ANNUAL CLAIMS REPORT

Section 39Q. (1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the

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form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim; the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document.

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Section 39R	KEEPING AND MAINTAINING OF BOOKS, RECORDS AND ACCOUNTS; STATEMENT OF MANAGEMENT ON INTERNAL ACCOUNTING CONTROL; FINANCIAL STATEMENTS; ENFORCEMENT

Section 39R. (a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

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(5) "Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a *certified* opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) "Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) if the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to

(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

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Title VII	CITIES, TOWNS AND DISTRICTS
Chapter 44	MUNICIPAL FINANCE
Section 31C	CONSTRUCTION CONTRACTS; CERTIFICATE AS TO AVAILABILITY OF FUNDS; EFFECT OF CERTIFICATE UPON DEFENSE OF INSUFFICIENCY OF APPROPRIATIONS

Section 31C. No contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public work by any city or town costing more than two thousand dollars shall be deemed to have been made until the auditor or accountant or other officer of the city or town having similar duties has certified thereon that an appropriation in the amount of such contract is available therefor and that an officer or agent of the city, town or awarding authority has been authorized to execute said contract and approve all requisitions and change orders. No order to the contractor for a change in or addition to the work to be performed under a contract subject to this section, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the contractor is willing to perform without any increase in the contract price, shall be deemed to have been given until the auditor or accountant, or other officer of the city or town having similar duties, has certified thereon that an appropriation in the amount of such order is available therefor; but such certificate shall not be construed as an admission by the city or town of its liability to pay for such work. The certificate of the auditor or accountant or other officer of the city or town having similar duties, that an appropriation in the amount of such contract or order is available shall bar any defense by the city or town on the grounds of insufficient appropriation; and any law barring payment in excess of appropriations shall not apply to amounts covered by any certificate under this section.

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Title XIV	PUBLIC WAYS AND WORKS
Chapter 82	THE LAYING OUT, ALTERATION, RELOCATION AND DISCONTINUANCE OF PUBLIC WAYS, AND SPECIFIC REPAIRS THEREON
Section 40	DEFINITIONS

Section 40. The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:—

"Company", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

"Description of excavation location", such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

"Emergency", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

"Excavation", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures, excluding excavation by tools manipulated only by human power for gardening purposes and use of blasting for quarrying purposes.

"Excavator", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

"Premark", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian

control or are misleading to the general public. Premarking shall not be required of any continuous excavation that is over 500 feet in length.

"Safety zone", a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.

"Standard color-coded markings", red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.

"System", the underground plant damage prevention system as defined in section 76D of chapter 164.

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Chapter 149	LABOR AND INDUSTRIES			
Section 34	PUBLIC CONTRACTS; STIPULATION AS TO HOURS AND DAYS OF WORK; VOID CONTRACTS			

Section 34. Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working within the commonwealth, in the employ of the contractor, sub-contractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency, or, in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one day, except as aforesaid; provided, that in contracts entered into by the department of highways for the construction or reconstruction of highways there may be inserted in said stipulation a provision that said department, or any contractor or sub-contractor for said department, may employ laborers, workmen, mechanics, foremen and inspectors for more than eight hours in any one day in such construction or reconstruction when, in the opinion of the commissioner, public necessity so requires. Every such contract not containing the aforesaid stipulation shall be null and void.

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Section 44A	DEFINITIONS APPLICABLE TO SECS. 44A TO 44H; COMPETITIVE BIDS ON CONSTRUCTION, ETC., OF PUBLIC WORKS; AWARD; BONDS; EXTREME EMERGENCY SITUATIONS; RECORDS CONTRACTS NOT SUBJECTED TO COMPETITIVE BID PROCESS			

Section 44A. (1) The words defined in this section shall have the meaning set forth below whenever they appear in sections forty-four A through forty-four H, inclusive, of this chapter unless indicated otherwise or unless the context in which they are used clearly requires a different meaning.

"Commissioner", means the commissioner of the division of capital asset management and maintenance or his designee.

"Public Agency" means a department, agency, board, commission, authority, or other instrumentality of the commonwealth or political subdivision of the commonwealth, or two or more subdivisions thereof but not including the Massachusetts Bay Transportation Authority;

"Responsible" means demonstrably possessing the skill, ability and integrity necessary to faithfully perform the work called for by a particular contract, based upon a determination of competent workmanship and financial soundness in accordance with the provisions of section forty-four D of this chapter;

"Eligible" means able to meet all requirements for bidders or offerors set forth in sections forty-four A through forty-four H of this chapter and not debarred from bidding under section forty-four C of this chapter or any other applicable law, and 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 on the work.

"Modular Building", a pre-designed building or units of a pre-designed building assembled and equipped with internal plumbing, electrical or similar systems prior to movement to the site where such units are attached to each other and such building is affixed to a foundation and connected to external utilities; or any portable structure with walls, a floor, and a roof, designed or used for the shelter of persons or property, transportable in one or more sections and affixed to a foundation and connected to external utilities. "Procurement", buying, purchasing, or otherwise acquiring and installing a modular building, and all functions that pertain to the acquisition and installation of a modular building, including description of requirements, selection and solicitation of sources, preparation and award of contract, and all phases of contract administration.

"Proprietary environmental technology systems", systems, in the town of Nantucket, including solid waste related equipment, supporting structures, and buildings, designed, manufactured, and produced under exclusive individual right to sell such product, pertaining to solid waste related environmental protection or remediation. Such systems shall include, but not be limited to, sequential, turnkey, construction management, design/build procurement, and the phasing of such procurement, including approval of design and construction stages as separate or combined phases.

(A) Every contract or procurement for the construction, reconstruction, installation, demolition, maintenance or repair of a building by a public agency estimated to cost less than \$10,000 shall be obtained through the exercise of sound business practices as defined in section 2 of chapter 30B. The public agency shall make and keep a record of each procurement that, at a minimum, shall include the name and address of the person from whom the services were procured. A public agency that utilizes a vendor on a statewide contract procured through the operational services division of the commonwealth, or a blanket contract procured by the public agency pursuant to this subsection, shall be deemed to have obtained the contract through sound business practices.

(B) Every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building estimated to cost not less than \$10,000 but not more than \$50,000 shall be awarded to the responsible person offering to perform the contract at the lowest price. The public agency shall make public notification of the contract and shall seek written responses from no fewer than 3 persons who customarily perform such work. The solicitation shall include a scope-of-work statement that defines the work to be performed and provides potential responders with sufficient information regarding the objectives and requirements of the public agency and the time period within which the work shall be completed. The public agency shall record the names and addresses of all persons from whom written responses were sought, the names of the persons submitting written responses and the date and amount of each written response. A public agency may utilize a vendor list established through a statewide contract procured through the operational services division to identify 1 or more of the persons from whom it will seek written responses for purposes of this paragraph. A public agency may also procure a blanket contract to establish a listing of vendors in certain defined categories of work that are under contract to provide services for multiple individual tasks of not more than \$50,000 each, and from whom written responses will be sought. Any such blanket contract procured by the awarding authority shall be procured pursuant to either section 39M of chapter 30 or sections 44A to 44J, inclusive, of chapter 149 which are applicable to projects over \$50,000. For purposes of this paragraph, the term "public notification" shall include, but not be limited to, posting at least 2 weeks

before the time specified in the notification for the receipt of responses, the contract and scope-ofwork statement: (1) on the website of the public agency, (2) on the COMMBUYS system administered by the operational services division, (3) in the central register published pursuant to section 20A of chapter 9 and (4) in a conspicuous place in or near the primary office of the public agency; provided, however, that if the public agency obtains a minimum of 2 written responses from a vendor list established through a blanket contract or a statewide contract procured through the operational services division, and the lowest of those written responses is deemed acceptable to the public agency, public notification is not required.

(C) Every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency estimated to cost more than \$50,000 but not more than \$150,000, except for a pumping station to be constructed as an integral part of a sewer construction or water construction project bid under the provisions of section 39M of chapter 30, shall be awarded to the lowest responsible and eligible bidder on the basis of competitive bids publicly opened and read in accordance with the procedure set forth in said section 39M of said chapter 30. The term "pumping station" as used in this section shall mean a building or other structure which houses solely pumps and appurtenant electrical and plumbing fixtures.

(D) Every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency estimated to cost more than \$150,000, except for a pumping station to be constructed as an integral part of a sewer construction or water construction project bid under the provisions of section 39M of chapter 30, shall be awarded to the lowest responsible and eligible general bidder on the basis of competitive bids in accordance with the procedure set forth in section 44A to 44H, inclusive.

(E) When the general court has approved the use of an alternative mode of procurement of construction for a project pursuant to section 7E of chapter 29, the awarding authority responsible for procuring construction services for the project shall follow the policies and procedures of this section and of section 44B to 44H, inclusive, to the extent compatible with the mode of construction procurement selected.

(F) Notwithstanding paragraph (E), a public agency may undertake the procurement of modular buildings, in accordance with section 44E. A public agency may procure site work for modular buildings, including but not limited to, construction of foundations, installations, and attachment to external utilities, or any portion of site work, either in combination with the procurement of modular buildings pursuant to section 44E or on the basis of competitive bids pursuant to the paragraph (E). Notwithstanding the paragraph (E), a public agency may procure energy management services in accordance with section 11C of chapter 25A and regulations promulgated thereunder.

(G) Every contract by a state agency or state assisted contract for design, construction, reconstruction, installation, demolition, maintenance or repair shall set forth the participation goals of minority and women workers to be employed on each such contract and the processes and procedures to ensure compliance with those workforce participation goals, including reporting and enforcement provisions.

(3) The award of every such contract in connection with which approval by an officer, board or agency of the federal government is required shall be made within thirty days, Saturdays, Sundays and legal holidays excluded, after such approval; and the award of every contract subject to this section in connection with which approval by an officer, board or agency of the federal government is not required shall be made within thirty days, Saturdays, Sundays and legal holidays excluded, after the opening of the bids therefor. If the bidder selected as the general contractor fails to perform his agreement to execute a contract in accordance with the terms of his bid and furnish a performance bond and also a labor and materials or payment bond as stated in his bid in accordance with section forty-four E, an award shall be made to the next lowest responsible and eligible bidder, subject to the provisions of sections forty-four A to forty-four H, inclusive, of this chapter. The thirty-day time limit shall not be applicable to a second or subsequent award made after expiration of the time limit with the consent of said next lowest responsible and eligible bidder, and made within the time limit was invalid, or because the bidder failed to execute the contract or to provide a performance bond and labor and materials or payment bond.

(4) In cases of extreme emergency, the awarding authority may, with the prior approval of the commissioner, award a contract for that portion of the work necessary to preserve the health or safety of persons or property or to alleviate an imminent security threat on the basis of such competitive bids or proposals as it can obtain in time to care for the extreme emergency and without public opening of the bids or proposals.

Where the nature of the emergency prevents the awarding authority from obtaining the prior approval of the commissioner, the awarding authority may contract for the necessary work without said prior approval; provided, however, that the approval of the commissioner shall still be sought at the earliest possible time; and provided, further, that if the commissioner at that time fails to approve the emergency determination the awarding authority shall promptly cease all work for which the emergency determination was denied. In such cases, the contractor shall be entitled to payment for the fair value of the labor and materials furnished prior to cessation of the work.

The commissioner shall maintain a record of all contracts awarded pursuant to this subsection, containing a description of the circumstances and the reasons for the commissioner's determination.

(5) (a) Notwithstanding the provisions of this section or any other general or special law to the contrary, a municipality may enter into a contract for proprietary environmental technology systems as defined in subsection (1) of this section without said contract being subject to the competitive bid

process as set forth in sections thirty-eight A 1/2 to thirty-eight *O*, inclusive, of chapter seven; this section and sections forty-four B to forty-four H, inclusive, of this chapter, and section thirty-nine M of chapter thirty; provided that the awarding authority meets the conditions set forth and receives the approvals required in paragraph (b) of this subsection.

(b) Prior to the issuance of any request for proposal with respect to the awarding of any contract pursuant to the provisions of paragraph (a) of this subsection, the awarding authority shall meet or obtain each of the following conditions or required approvals: (1) the municipality shall appoint qualified persons to conduct a thorough review of all available environmental technology, including both proprietary and non-proprietary environmental technology, and if the conclusion of this review is that a contract for proprietary environmental technology systems is in the public interest, such conclusion shall be supported by sound documented reasons in writing available for public inspection; (2) the city council, the board of selectmen, or the town meeting shall take a majority vote finding that it is in the public interest to enter into a contract for proprietary environmental technology systems, as defined in subsection (1) of this section, providing such vote is supported by the conclusion of the review conducted pursuant to condition (1); (3) both the attorney general and the commissioner of the department of environmental protection shall grant written approval; (4) said contract shall be subject to any limitation in the waiver of sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, sections forty-four A to forty-four H of chapter one hundred and forty-nine, and section thirtynine M of chapter thirty imposed by either the attorney general or the commissioner of the department of environmental protection as a condition for a grant of approval by said officers; and (5) every proprietary environmental technology systems contract shall be as compatible with sections thirtyeight A to thirty-eight O, inclusive, of chapter seven, sections forty-four A to forty-four H of chapter one hundred and forty-nine, and section thirty-nine M of chapter thirty as is feasible for the procurement of the proprietary environmental technology systems chosen.

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Section 44F	PLANS AND SPECIFICATIONS; SUB-BIDS; FORM; CONTENTS		

Section 44F. (1)(a) Every contract subject to section forty-four A shall include specifications and, if deemed necessary or convenient by the awarding authority, plans, detailing all labor and materials to be furnished thereunder. Such specifications shall have a separate section for each of the following classes of work if in the estimate of the awarding authority such class of work will exceed \$25,000: (a) roofing and flashing; (b) metal windows; (c) waterproofing, damp-proofing and caulking; (d) miscellaneous and ornamental iron; (e) lathing and plastering; (f) acoustical tile; (g) marble; (h) tile; (i) terrazzo; (j) resilient floors; (k) glass and glazing; (l) painting; (m) plumbing; (n) heating, ventilating and air-conditioning; (o) electrical work, including direct electrical radiation for heating; (p) elevators; (q) masonry work; (r) fire protection sprinkler system as defined in section 81 of chapter 146; and (s) any other class of work for which the awarding authority deems it necessary or convenient to receive sub-bids, provided that the awarding authority may, in addition, receive a combined sub-bid on the marble, tile and terrazzo work, but in that event, the marble, tile and terrazzo work shall each be a class of work for which the sub-bidder must list the information in a clearly designated place on the bid form for that purpose. Each separate section in the specifications prescribed or provided for by this paragraph shall state the time limit for filing sub-bids with the awarding authority, shall specify by number each sheet of plans showing work to be done by the subcontractor under such section, and shall require the subcontractor to install all materials to be furnished by him under such section other than materials which in the opinion of the awarding authority it is not customary under then current trade practices for such subcontractor to install and the installation of which is expressly required by another section of the specifications. Each class of work set forth in a separate section of the specifications pursuant to this section shall be a sub-trade designated in the appropriate category of the general bid form and shall be the matter of subcontract made on the basis of sub-bids in accordance with the procedure set forth in sections forty-four F(1)—(5).

Each separate section of the specifications required by the provisions of this section shall contain a paragraph describing by class of work and by reference to paragraph numbers in that section, each class of work, if any, requiring labor and materials which, in the opinion of the awarding authority

based upon an investigation of the work involved, is customarily performed in that sub-trade under subcontract with a sub-bidder for that sub-trade, and which is estimated by the awarding authority to cost in excess of \$25,000, and only each class of work so described shall be a class of work for which sub-bidder for that sub-trade must list the information required in the appropriate place designated on the bid form for that purpose.

Every contract subject to section forty-four A shall include specifications for the installation of weather protection and shall require that the general contractor shall install the same and that he shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the commissioner of planning and operations in the executive office for administration and finance.

[There is no paragraph (b) of subsection (1).]

(2) Every sub-bid submitted in connection with a contract subject to section forty-four A for a subtrade designated in item 2 of the general bid form pursuant to section forty-four E shall be submitted on a form furnished by the awarding authority and containing the following provisions:

FORM FOR SUB-BID

To all General Bidders Except those Excluded:

A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in Section No. _______ of the specifications and in any plans specified in such section, prepared by

			_ for	in
(name of architect or	engineer)(proje	ct)		
		, Massach	usetts, for th	ne contract
(city or town)				
sum of	dollars (\$).			
For Alternate No.	; Add \$	Subtract \$		
[Repeat preceding lin	e for each alter	nate]		
B. This sub-bid includ	des addenda nui	mbered		
C. This sub-bid				
\Box may be used by an	y general bidde	r except:		

 \Box may only be used by the following general bidders:

[To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.]

D. The undersigned agrees that, if he is selected as a sub-bidder, he will, within 5 days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested so to do in the general bid by the general bidder, who shall pay the premiums therefor, or if prequalification is required pursuant to section 44D 3/4, furnish a performance and payment bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the specifications for this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specifications, the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

[Do not give bid price for any class or part thereof furnished by undersigned.]

F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

G. The undersigned further agrees to be bound to the general contractor by the terms of the hereinbefore described plans, specifications, including all general conditions stated therein, and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the owner.

H. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications:—

1. Have been in business under present business name

2. Ever failed to complete any work awarded?

3. List one or more recent buildings with names of the general contractor and architect on which you served as a sub-contractor for work of similar character as required for the above-named building.

4. Bank reference

I. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; 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 that is at least 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; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.

The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date

(Name of Sub-bidder)

By

(Title and Name of Person Signing Bid)

(Business Address)

(City and State)

(3) Every sub-bid in connection with a contract subject to section forty-four A for a sub-trade designated on the general bid form pursuant to section forty-four F(2) shall be for the complete work of the sub-trade as specified, and shall be filed with the awarding authority, in a sealed envelope, before twelve o'clock noon at least four days, Saturdays, Sundays and legal holidays excluded, before
the day fixed by the awarding authority for the opening of general bids, and forthwith after the time limit for the filing thereof shall be publicly opened and read by the awarding authority, which, within two days thereafter, Saturdays, Sundays and legal holidays excluded, shall reject every sub-bid which is not accompanied by a bid deposit as prescribed in sub-section (2) of section forty-four B, or which otherwise does not conform with sections forty-four A to forty-four H, inclusive, or which is on a form not completely filled in, or which is incomplete, conditional or obscure, or which contains any addition not called for; provided, however, that the failure of the awarding authority to reject such a sub-bid within such period shall not validate such a sub-bid nor preclude the awarding authority from subsequently rejecting it. Not later than the second day, Saturdays, Sundays and legal holidays excluded, before the day fixed by the awarding authority for the opening of general bids, the awarding authority shall mail to every person on record as having taken a set of plans and specifications list of sub-bidders arranged by sub-trades and listing for each sub-trade the name, address and sub-bid price of every sub-bidder submitting a sub-bid thereon not rejected by the awarding authority and the general bidders excluded from using such sub-bid. A person shall not be named by a general bidder as a sub-bidder for a sub-trade on the general bid form unless such person is included for such sub-trade in said list. If a general bidder not excluded in said list from doing so names as a sub-bidder for a subtrade on the general bid form a person included for such sub-trade in said list at the sub-bid price stated in said list, neither the general bid of such general bidder nor the general contract executed on the basis of such general bid shall be invalid or rejected because of the invalidity of such sub-bid, or because of error in said list, nor shall such general bid be rejected nor shall such general contract be invalid because of any invalid action taken by the awarding authority in connection with any sub-bid or sub-bids; but there shall be substitution of sub-bidders and adjustment of contract price as if paragraph (c) of section forty-four F(4) were applicable. No sub-bid shall be rejected because of the failure to submit prices for or information relating to, any item or items for which no space is provided in the sub-bid form furnished by the awarding authority; but this sentence shall not be applicable to any failure to furnish prices or information required by section forty-four F to be furnished in the Form for Sub-Bid.

Every sub-bidder duly filing a sub-bid with the awarding authority as aforesaid shall be bound thereby to every general bidder not excluded therein from the use thereof; and any variance from such sub-bid communicated to a general bidder shall be of no effect.

A performance and payment bond furnished by the subcontractor, either pursuant to the requirements of the prequalification process as established in section 44D 3/4 or at the request of a general contractor set forth in the general bid form, shall be for the benefit of the general contractor; shall secure the performance of the subcontract by the subcontractor; and shall indemnify and hold harmless the general contractor and the surety or sureties under the labor and materials or payment bond furnished by the general contractor to the awarding authority against (i) any and all loss and expense

arising out of any and all claims in connection with the performance of the subcontract which would be required to be paid under the labor and materials or payment bond furnished by the general contractor to the awarding authority and (ii) attorneys' fees in the event that the subcontractor, after notice, fails to assume the defense of and defend such claims.

Each sub-bidder shall list in the sub-bid form the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the section of the specifications for that sub-trade requires such listing; provided that, in the absence of a contrary provision in the specifications, any sub-bidder may, without listing any bid price, list his own name for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid opening, shows to the satisfaction of the awarding authority that he does customarily perform such class of work or the part thereof with employees on his own payroll who are mechanics or laborers as referred to in section twenty-six, and is qualified so to do.

If a sub-trade for which the awarding authority is required to take filed sub-bids constitutes the predominant work of the contract, the awarding authority may include that sub-trade work as part of the general bidder's work. The awarding authority shall award the general contract to the lowest responsible and eligible bidder who customarily performs that sub-trade with employees on his own payroll who are mechanics or laborers as referred to in said section twenty-six, except for any part of that sub-trade customarily performed by sub-contractors.

(4)(a)(1) If no sub-bid is filed for a sub-trade designated in the general bid form or if the only sub-bids which are filed are restricted to the use of one or more general bidders, the awarding authority may state, in an addendum issued with the list of sub-bidders required by subsection (3), that the general bidder shall include in the cost of his own work an amount to cover all the work required for any such sub-trade. The general contractor shall cause the work covered by such sub-trade to be done by a qualified and responsible sub-contractor, subject to the written approval of the awarding authority. If the awarding authority determines that any sub-contractor chosen by the general contractor under this section is not qualified or responsible, the general contractor shall obtain another sub-contractor who is satisfactory to the awarding authority with no adjustment in the general contractor's price.

(2) If a rejection of all sub-bids, other than as set forth above, for such a sub-trade occurs pursuant to subsection (1) of section forty-four E or subsection (3) of this section, the awarding authority shall state, in an addendum issued with the list of sub-bidders required by said subsection (3), the amount to be included by a general bidder on the general bid form for such sub-trade; and without in any way affecting other sub-bidders who have conformed to the prescribed bidding procedure, new sub-bids for such sub-trade shall be requested forthwith by written invitation to three or more qualified sub-bidders and shall be publicly opened and read by the awarding authority at a time and place to be specified in such invitation. The general contractor shall cause the work covered by such sub-trade to be done by the lowest responsible and eligible sub-bidder against whose standing and ability the general

contractor makes no objection or, if there is no such sub-bidder, by such sub-contractor against whose standing and ability the general contractor makes no objection and for such sum as the general contractor and the awarding authority may agree upon; and the contract price shall be adjusted by the difference between the sub-contract sum and the amount stated in the addendum. The general bidder shall include in the cost of his own work on the general bid form all expenses and profits on account of such adjustments.

(b) If, after the selection of the lowest responsible and eligible general bidder, it be decided to consider sub-bidders other than the ones named by such general bidder in his general bid, the awarding authority and such general bidder shall jointly consider all filed sub-bids not rejected under section forty-four F(3). Any agreement to substitute a sub-bid for the one named in the selected general bid shall result in an adjustment of the general bid price by the difference between the amount of the subbid originally named and the amount of the sub-bid substituted therefor. If by such substitutions the total adjusted general bid price of the general bidder first selected becomes greater than the original general bid price of the second lowest responsible and eligible general bidder, then the latter shall be selected and his sub-bidders similarly considered. If, by substitutions as hereinbefore provided, the total adjusted general bid price of the second selected general bidder becomes greater than the total adjusted general bid price of the general bidder first selected or greater than the original general bid price of the third lowest responsible and eligible general bidder, then the bidder having the lower of these two general bid prices shall be selected; provided, that if the third lowest responsible and eligible general bidder is selected, his sub-bidders shall be similarly considered. The general bidder finally selected by the aforementioned process of substitutions shall be the general bidder to whom the contract shall be awarded.

(c) If a selected sub-bidder fails, within 5 days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, to perform his agreement to execute a subcontract in the form hereinafter set forth with such general bidder, contingent upon the execution of the general contract, and, if required to do so pursuant to the prequalification process under section 44D 3/4 or if requested to do so by such general bidder in the general bid, to furnish a performance and payment bond as stated in his sub-bid such general bidder and the awarding authority shall select, from the other sub-bids duly filed with the awarding authority for such sub-trade and not rejected under section 44H the lowest responsible and eligible sub-bidder at the amount named in his sub-bid as so filed against whose standing and ability the general contractor makes no objection, and the contract price shall be adjusted by the difference between the amount of the sub-bid of the delinquent sub-bidder.

The subcontract shall be in the following form:

SUBCONTRACT

THIS AGREEMENT MADE THIS ___ DAY OF ___ (insert year), by and between ____ a corporation organized and existing under the laws of ____ an individual doing business as ____ hereinafter called the "Contractor" and ____ a corporation organized and existing under the laws of ____ an individual doing business as ____ hereinafter called the "Subcontractor".

WITNESSETH that the Contractor and the Subcontractor for the considerations hereafter named, agree as follows:

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work specified in Section No. ______ of the specifications for ______

(Name of Sub-Trade) and the plans referred to therein and addenda No._____,

_____, ____, and _____ for the

(complete title of the project and the project number taken from the title page of the specifications)all as prepared by

_____, _____, ____

(a) The Subcontractor agrees to be bound to the Contractor by the terms of the hereinbefore described plans; specifications (including all general conditions stated therein) and addenda No. _____, and _____, and _____, and to assume to the Contractor all the obligations and responsibilities that the Contractor by those documents assumes to the

(Awarding Authority) hereinafter called the "Awarding Authority", except to the extent that provisions contained therein are by their terms or by law applicable only to the Contractor.

(b) The Contractor agrees to be bound to the Subcontractor by the terms of the hereinbefore described documents and to assume to the Subcontractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the Contractor, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority.

2. The Contractor agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Subcontractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the Contractor, either oral or in writing, the Subcontractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Subcontractor agrees to furnish to the Contractor within a reasonable time after the execution of this subcontract, evidence of workers' compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the Contractor.

4. The Contractor agrees that no claim for services rendered or materials furnished by the Contractor to the Subcontractor shall be valid unless written notice thereof is given by the Contractor to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. This agreement is contingent upon the execution of a general contract between the Contractor and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the date and year first above-written.

SEAL	
ATTEST	
(Name of Subcontractor)	
By	
SEAL ATTEST	
(Name of Contractor)	
By	

In the event that the contract between the general contractor and the awarding authority does not contain provisions granting to the awarding authority the right to terminate the general contract when the general contractor encounters financial difficulties or fails to make satisfactory progress, the general contractor may insert the following paragraph:

If the Subcontractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Contractor, or otherwise be guilty of a substantial violation of any provision of the contract, then the Contractor may, without prejudice to any other right or remedy and after giving the Subcontractor and his surety, if any, seven days' written notice, terminate the employment of the Subcontractor and take possession of the premises and of all materials, tools and appliances thereon

and finish the work by whatever method he may deem expedient. In such case the Subcontractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the contract price shall exceed the expense of finishing the work including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the Subcontractor. If such expense shall exceed such unpaid balance, the Subcontractor shall pay the difference to the Contractor.

The contractor and subcontractor shall have the right to seek damages for breach of a subcontract without terminating the subcontract or ceasing performance thereunder.

All sub-bidders when finally selected shall be notified in writing of their selection within forty-eight hours thereafter by the general bidder.

In each case of substitution of a sub-bidder for a sub-bidder listed in the general bid of the selected general contractor, the selected general contractor may require the substituted sub-bidder to furnish a performance and payment bond, and the premiums for same shall be added to the general bidder's price for work to be performed by him except where the selected general contractor had indicated in his general bid that the original sub-bidder designated for that sub-trade, in which substitution was made, would be required to furnish such bond.

In the instances enumerated in paragraphs (1), (2) and (3) of this section, the general bidder's price for work to be performed by him shall also be adjusted by the amount of the change in the premium for the general contractor's performance bond and his labor and materials or payment bond caused by the substitution.

(5) If a general bidder customarily performs, with employees on his own payroll who are mechanics or laborers as referred to in section twenty-six, a sub-trade for which the awarding authority invites subbids, he may submit a sub-bid for such sub-trade which shall be considered on a par with other subbids, and he shall also list under the appropriate sub-bid category in his general bid his own name and sub-bid price for such sub-trade. No such sub-bid shall be considered unless the general bidder can show (a) he does so customarily perform such sub-trade, and (b) he is qualified to do the sub-trade work.

In lieu of listing his name and sub-bid price in his general bid, such general bidder may list the name and amount of the lowest responsible and eligible sub-bidder for that sub-trade if (a) such sub-bidder's price is lower than his, (b) such sub-bid is available for his use; and (c) such sub-bid is not restricted to his use alone or to his use and that of another general bidder, or bidders.

ADMINISTRATION OF THE GOVERNMENT
LABOR AND INDUSTRIES
LABOR AND INDUSTRIES
INVITATIONS TO BID; NOTICE; CONTENTS; VIOLATIONS; PENALTY

Section 44J. (1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefor shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project, and on the COMMBUYS system administered by the operational services division. Said notice shall also be published at such other times and in such other newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specifications of the proposed work may be had; the time and place of submission of general bids; and the time and place for opening of the general bids. For contracts subject to the provisions of sections forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids.

Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection. (5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district of municipal agency.

Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

(9) No request for proposals or invitation for bids issued under sections 38A 1/2 to 38*O*, inclusive, of chapter 7, section 11C of chapter 25A, section 39M of chapter 30, this section and sections 44A to 44H, inclusive, shall be advertised if the awarding authority's cost estimate is greater than 1 year old.

520 CMR: DEPARTMENT OF PUBLIC SAFETY

520 CMR 14.00: EXCAVATION AND TRENCH SAFETY

Section

- 14.01: Authority, Purpose, and Scope
- 14.02: Definitions
- 14.03: Permitting Requirements
- 14.04: Protections for the General Public
- 14.05: Suspension and Revocation of Permits; Assessment of Fines; Immediate Shut-down; Appeals

14.01: Authority, Purpose, and Scope

(1) <u>Purpose and Scope</u>.

(a) 520 CMR 14.00 is promulgated by the Department of Public Safety in conjunction with the Division of Occupational Safety pursuant to authority granted by M.G.L. c. 82A, § 1.
(b) The purpose of 520 CMR 14.00 is to establish reasonable standards to protect the safety of the citizens of the Commonwealth of Massachusetts from the hazards inherent in trenches and to provide for penalties for individuals who violate any provision of 520 CMR 14.00.

- (2) <u>Applicability Provision</u>. 520 CMR 14.00 shall apply to any excavator:
 - (a) shall not be construed or enforced in a manner that directly, substantially or specifically regulates the occupation, safety or health of any employee engaged in employment covered by the Federal Occupational Safety and Health Act (OSHA).
 - (b) shall be read in conjunction with and shall not supersede, be construed or be enforced in a manner that contradicts 780 CMR: *The Massachusetts State Building Code*.

14.02: Definitions

<u>Emergency</u>. An unforeseen condition in which the safety of the public is in imminent danger because of a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

<u>Excavator</u>. Any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body or public agency which performs excavation operations including the excavation of trenches.

General Public. All natural persons not engaged in construction activities at a trench site.

<u>Permit Holder</u>. The excavator who is responsible for acquiring a permit from the Permitting Authority.

<u>Permitting Authority</u>. A city, town, or public agency required to administer the provisions of 520 CMR 14.03.

<u>Public Agency</u>. A department, agency, board, commission, authority, or other instrumentality of the commonwealth.

<u>Serious Injury</u>. A personal injury that results in death, dismemberment, significant disfigurement, permanent loss of the use of a body organ, member, function, or system, a compound fracture, or other significant injury that requires immediate admission and overnight hospitalization and observation by a licensed physician.

<u>Trench</u>. An excavation which is narrow in relation to its length, made below the surface ground in excess of three feet below grade and the depth of which is, in general, greater than the width, but the width of the trench, as measured at the bottom, is no greater than 15 feet.

<u>Unattended Trench</u>. A trench where neither the, excavator, or any of the people who are engaged in construction activities at the trench, are present.

520 CMR: DEPARTMENT OF PUBLIC SAFETY

14.03: Permitting Requirements

(1) No person shall, except in an emergency, make a trench excavation, in any public way, public property, or privately owned land until a permit is obtained from the appropriately designated permitting authority.

(2) Issuance of Permit.

(a) No person shall, except in an emergency, contract for the making of or make a trench, in any public way, public property, or privately owned land until a permit is obtained from the appropriately designated person within the city, town, or public agency that is authorized to issue the permit. The Permitting Authority may issue a single project permit for multiple trenches in a project.

(b) Each city, town or regionalized entity shall designate one board or officer to issue permits for the excavation of trenches on privately owned land or land owned by a city or town. Cities or towns that regionalize or share permitting and inspection functions with other cities or towns may utilize these regionalized entities for the permitting of trenches.

(c) Any individual or entity creating a trench on property that is owned or controlled by a public agency or that a public agency otherwise has a property interest in, including but not limited to an easement, shall obtain a permit from that public agency unless the permitting authority is otherwise designated through a written agreement. The public agency issuing the permit shall electronically notify the Department of Public Safety of the permit's issuance and shall provide the following information:

- 1. The location of the excavation indicated on the permit;
- 2. The anticipated date to begin the trench operation;
- 3. The anticipated date to conclude the trench operation;
- 4. The name of the permit holder; and

(d) When issuing a permit under 520 CMR 14.03(2), the permitting authority shall attach a summary of OSHA Regulation 1926 Subpart P-Excavations and a summary of any regulation promulgated by the Department of Public Safety in conjunction with the Division of Occupational Safety in accordance with M.G.L. c. 82A.

(3) <u>Permit Requirements</u>. In order to obtain a permit, the following information must be submitted to the permitting authority:

- (a) Completed application;
- (b) Certificate of insurance;
- (c) Required fee in accordance with 520 CMR 14.03(6) where applicable.

(4) <u>Contents of Permit Applications</u>. All permit applications must contain the following information:

- (a) Digsafe number;
- (b) Name and contact information of the excavator;
- (c) Emergency (after hours) contact information;
- (d) Permit expiration date (if applicable);
- (e) Specific location of the trench(es);
- (f) Name and contact information of insurer;

(g) All permit applications shall also include the following statements pursuant to M.G.L. c. 82A, \S 3(3) and (5)(i) and (ii):

1. "Persons engaging in any trenching operation shall familiarize themselves with the federal safety standards promulgated by the Occupational Safety and Health Administration on excavations: 29 CFR 1926.650 *et seq.*, entitled Subpart P Excavations."

2. "By applying for, accepting and signing this permit, the applicant attests to the following:

a. that he has read and understood the regulations promulgated by the Department of Public Safety with regard to trench safety;

b. that he has read and understood the federal safety standards promulgated by the Occupational Safety and Health Administration on excavations: 29 CFR 1926.650 *et seq.*, entitled Subpart P "Excavations".

14.03: continued

(5) <u>Posting</u>. All Permits issued pursuant to 520 CMR 14.00 shall be posted in plain view on the site of the trench. All permits shall be made available to the permitting authority, any investigator from the Division of Occupational Safety, any inspector of the Department of Public Safety, or any other lawfully authorized authority.

(6) <u>Permit Fees</u>. In accordance with M.G.L. c. 82A, § 2, the local permitting authority may charge a reasonable fee to cover the administrative costs incurred by the authority in connection with the review and processing of permits except that a gas company, as defined in M.G.L. c. 164, § 1, or any corporation that is subject to the provisions of M.G.L. chs. 165, 166 or 166A which has already paid a fee in order to attain a permit to excavate a public way of a city or town shall not be responsible for paying an additional fee for the same excavation.

(7) Excavators engaging in any trenching operation who utilize hoisting or other mechanical equipment subject to M.G.L. c. 146 shall only employ individuals licensed to operate said equipment by the department of public safety pursuant to M.G.L. c. 146 and the permit shall be presented to the licensed operator before excavation is commenced.

14.04: Protections for the General Public

(1) <u>Generally</u>. Wherever an unattended trench exists, the operation shall be secured in a safe manner and suitable protection for the general public shall be provided. The Excavator shall secure the unattended trench to prevent unauthorized entry when work is not in progress.

(2) <u>Trenches on Public Ways</u>. Access to unattended trenches opened during construction on a public way shall be restricted by covers or barriers.

(a) Where covers are used they shall be comprised of steel metal plates no less than ³/₄ inch thick, or equivalent. Covers shall be placed over the trench. Such covers shall be level and physically secure to prevent the creation of a hazard by inadvertent movement.

(b) Where barriers are used they shall comply with the following provisions:

1. A continuous barrier not less than six feet in height shall surround the unattended trench.

2. All barriers shall be of adequate strength and shall be supported in a manner that will allow them to be seen by the motorist and provide a stable support not easily blown over by the wind or traffic.

3. Trench barriers adjacent to high speed traffic may include traffic control barrels ballasted by sandbags or temporary pre-cast concrete barriers as components.

4. Trench barriers comprised of multiple sections shall allow not more than four inches between each section. Adjacent sections must be securely fastened to each other.

5. Any openings between the ground and barrier shall not exceed four inches. Openings greater than four inches may be protected by solid guards of suitable materials, including plywood or wood planks.

6. Barriers shall be at a sufficient distance from the trench to be unaffected by changing conditions of the trench site.

(3) <u>Trenches at Fixed Work Sites Other than on a Public Way</u>. Access to unattended trenches opened during construction at a fixed work site on public or private property shall be restricted by covers or portable barriers.

(a) Where covers are used they shall be comprised of steel metal plates no less than ³/₄ inch thick or equivalent. Covers shall be placed over trenches. Such covers shall be level and physically secure to prevent the creation of a hazard by inadvertent movement.

(b) Where portable protective barriers are used, barriers of a height not less than six feet shall be constructed surrounding the entire perimeter of the trench.

1. Barriers comprised of multiple sections may allow not more than four inches between each section. Adjacent sections must be securely fastened to each other.

2. Openings between the ground and fence shall not exceed four inches. Openings greater than four inches may be protected by solid guards or suitable materials, including plywood or wood planks.

3. Fence-type barriers shall be adequately secured by vertical support members. Fencing spaces shall not exceed four inches when measured as mesh size or between slats.

4. Solid barriers shall not contain holes or indentations larger than four inches.

5. All horizontal support members shall be located on the trench side of the barrier.

6. The wall of a dwelling or other permanent structure of a height of not less than six feet may serve as part of the barrier, provided it complies with all of the provisions of 520 CMR 14.04.

7. Gates and other means of egress must:

- a. Comply with the size and strength provisions of 520 CMR 14.04(3)(b);
- b. Be securely fastened to adjacent barrier components;
- c. Allow not more than four inches between gates and barrier components; and
- d. Be securely locked with a padlock, combination lock, or other suitable locking device.

8. Barriers must be clearly marked on all sides with signs indicating "Danger - Do Not Enter", "Authorized Personnel Only" or equivalent warning.

9. Barriers shall be placed at a sufficient distance from the trench to be unaffected by changing conditions of the trench site.

(4) The provisions of 520 CMR 14.04 may be substituted by continuous personal monitoring of the unattended trench by the permit holder or by person(s) under the control and direction of the permit holder.

(5) The provisions of 520 CMR 14.04 may be substituted by backfilling the work site while unattended.

(6) The permitting authority may require any additional, site-specific provisions it deems necessary to protect the general public as a condition to any permit issued.

14.05: Suspension and Revocation of Permits; Assessment of Fines; Immediate Shut-down; Appeals

(1) <u>Scope</u>. 520 CMR 14.05 establishes the suspension and revocation procedures for all permits, establishes the penalty structure for the assessment of administrative penalties and sets forth the procedure for immediate shut down of the site.

(2) <u>Revocation and Suspension of Permit by Permitting Authority</u>. The permitting authority may, after a hearing, suspend or revoke a permit issued pursuant 520 CMR 14.03. All hearings under 520 CMR 14.05 shall be held in accordance with M.G.L. c. 30A and 801 CMR 1.02. Each permitting authority shall have the discretion to establish the grounds consistent with 520 CMR 14.00 for a suspension or revocation however such suspension or revocation shall not be imposed in a manner which directly, substantially or specifically regulates the occupational safety or health of any employee engaged in employment covered by the Federal Occupational Safety and Health Act.

(3) Assessment of Fines by the Department of Public Safety.

(a) Notwithstanding any action taken by a permitting authority pursuant to 520 CMR 14.05(2), the Department of Public Safety may assess administrative fines against the excavator in accordance with M.G.L. c. 82A § 1.

(b) <u>Penalty Structure</u>. Whenever the Department of Public Safety finds upon inspection, investigation or other information in its possession, that a violation of any provision of 520 CMR 14.00 has occurred, the Department may assess an administrative penalty not to exceed \$5,000.00 for each violation. Each day during which a violation exists shall constitute a separate offense.

(c) <u>Factors in Determining Amount of Penalty</u>. In determining the amount of the administrative penalty, the Department of Public Safety may consider one or more of the following:

1. The willfulness of the violation;

2. Previous violations resulting in the imposition of administrative penalties as set forth in the rules of the Department of Public Safety;

3. Whether the violation resulted in an accident involving bodily injury or death to a member of the general public;

4. The actual or potential danger to the public;

5. Whether the excavator did everything reasonable to attempt to comply with 520 CMR 14.00;

6. Actions, if any, taken by the permitting authority;

7. Whether imposition of the administrative penalty is likely to deter future noncompliance; and

8. The interests of public safety.

(d) <u>Notice</u>. The Department of Public Safety shall send written notice of alleged violation(s) and intent to impose administrative penalties to the violator. The Notice shall specify:

- 1. The specific condition(s) which constitute the violation;
- 2. The provision(s) of 520 CMR 14.00 with which there has been non-compliance;
- 3. The amount that is to be assessed as a penalty for each alleged violation;
- 4. The procedure for requesting a hearing as set forth in 520 CMR 14.05(7).

(e) <u>Hearings</u>. Written requests for a hearing must be filed with the Department of Public Safety within ten calendar days of receipt of the notice of violation issued pursuant to 520 CMR 14.05(7).

(4) The failure to make a timely request for a hearing shall constitute a waiver of the right to a hearing and imposition of the penalty set forth in the Notice. A hearing shall be commenced by the Department of Public Safety within a reasonable period after the request for a hearing has been received by the Department of Public Safety. Any person aggrieved by a determination of the Department of Public Safety may appeal to the Superior Court in accordance with M.G.L. c. 30A, §14.

(5) Immediate Shutdown by State or Local Authorities.

(a) Whenever the permitting authority, or an inspector from either the Department of Public Safety or the Division of Occupational Safety deems a condition at a trench site to be a threat to public safety he may order that the area around the trench be made safe for the general public and may further order the immediate shutdown of the site until such time as the condition has been corrected to the satisfaction of the authority responsible for the immediate shutdown.

(b) Conditions which warrant immediate shutdown of a trench site by the local permitting authority, an inspector from the Department of Public Safety or the Division of Occupational Safety may include:

1. A fatality or serious injury to a member of the general public;

2. Failure to use protections for the General Public in accordance with 520 CMR 14.00 or an ineffective use of any protection for the General Public allowed by 520 CMR 14.04;

3. Failure to obtain a permit from the permitting authority;

4. Any other condition that constitutes a serious threat to life, limb or property of the general public as determined by the permitting authority, an inspector from the Department of Public Safety, or the Division of Occupational Safety.

(6) <u>Re-inspection Following Immediate Shutdown</u>. The trench site shall remain closed until all necessary repairs and corrections have been made to the satisfaction of the authority responsible for the immediate shutdown, provided however, that the Department of Public Safety and Division of Occupational Safety shall have concurrent jurisdiction to authorize the reopening of a trench shut down by either agency. Reopening of the site may not occur until the site has been inspected by the authority ordering the immediate shutdown and found to be safe for reopening and operation; said inspection shall occur within two business days of written notification by the Excavator to the Permitting Authority that it has complied with all repairs and corrections ordered by the Permitting Authority.

14.05: continued

(7) <u>Appeal from Immediate Shutdown</u>. Any person aggrieved by the decision by the Department of Public Safety, the Division of Occupational Safety, or the permitting authority to shut down a trench site pursuant to 520 CMR 14.05(5) may make an appeal for a hearing to the entity responsible for the immediate shutdown. The site shall remain shut down during the appeal period. Such appeal shall be made in writing within ten calendar days. Upon receipt of the appeal, a hearing shall be scheduled promptly. All hearings under 520 CMR 14.05(5) shall be held in accordance with M.G.L. c. 30A and 801 CMR 1.02. Any person aggrieved by a decision after hearing may appeal to the Superior Court in accordance with M.G.L. c. 30A, § 14.

(8) Serious Injury/Fatality; Notification; Investigation.

(a) <u>Notification</u>. An excavator shall report all serious injuries or fatalities which occur at the location of a trench to the State Police within one hour from the time the serious injury occurred.

(b) <u>Investigation</u>. In the event that a serious injury or fatality occurs, the trench site shall be immediately secured. The site surrounding the trench shall not be disturbed, cleaned, or altered in any way except by a public authority or as necessary for the preservation of life and property or the removal of the injured person(s) until receiving express authorization from an inspector of the Department of Public Safety.

REGULATORY AUTHORITY

520 CMR 14.00: M.G.L. c. 82A, §§ 1 through 5.

ATTACHMENT E

MASSACHUSETTS PREVAILING WAGE RATES



CHARLES D. BAKER Governor

KARYN E. POLITO Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

ROSALIN ACOSTA Secretary WILLIAM D MCKINNEY Director

Awarding Authority:	West Springfield Department of Public Works			
Contract Number:	CWSRF-4513	City/Town:	WEST SPRINGFIELD	
Description of Work:	Approximately 17,000 linear feet of PVC gravity sewer mains, 2,100 linear feet of HDPE sewer force mains, 1,200 linear feet of PVC low-pressure sewer, sanitary manholes, and two pump stations.			
Job Location:	Birnie Avenue/Piper Road Area			

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

• 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 from the Department of Labor Standards ("DLS") 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 any sub-contractor.

• All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person 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 DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.

• 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. Awarding authorities are required to request these updates 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, 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. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.

• Every contractor or subcontractor which performs construction work on the project is required to 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. A sample of a payroll reporting form may be obtained at 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.

• Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

• 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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemplovment	Total Rate
Construction					• -	
(2 AXLE) DRIVER - EQUIPMENT	12/01/2019	\$34.25	\$12.41	\$13.72	\$0.00	\$60.38
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	06/01/2020	\$35.15	\$12.41	\$13.72	\$0.00	\$61.28
	08/01/2020	\$35.15	\$12.91	\$13.72	\$0.00	\$61.78
	12/01/2020	\$35.15	\$12.91	\$14.82	\$0.00	\$62.88
	06/01/2021	\$35.95	\$12.91	\$14.82	\$0.00	\$63.68
	08/01/2021	\$35.95	\$13.41	\$14.82	\$0.00	\$64.18
	12/01/2021	\$35.95	\$13.41	\$16.01	\$0.00	\$65.37
(3 AXLE) DRIVER - EQUIPMENT	12/01/2019	\$34.32	\$12.41	\$13.72	\$0.00	\$60.45
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	06/01/2020	\$35.22	\$12.41	\$13.72	\$0.00	\$61.35
	08/01/2020	\$35.22	\$12.91	\$13.72	\$0.00	\$61.85
	12/01/2020	\$35.22	\$12.91	\$14.82	\$0.00	\$62.95
	06/01/2021	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	08/01/2021	\$36.02	\$13.41	\$14.82	\$0.00	\$64.25
	12/01/2021	\$36.02	\$13.41	\$16.01	\$0.00	\$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT	12/01/2019	\$34.44	\$12.41	\$13.72	\$0.00	\$60.57
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	06/01/2020	\$35.34	\$12.41	\$13.72	\$0.00	\$61.47
	08/01/2020	\$35.34	\$12.91	\$13.72	\$0.00	\$61.97
	12/01/2020	\$35.34	\$12.91	\$14.82	\$0.00	\$63.07
	06/01/2021	\$36.14	\$12.91	\$14.82	\$0.00	\$63.87
	08/01/2021	\$36.14	\$13.41	\$14.82	\$0.00	\$64.37
	12/01/2021	\$36.14	\$13.41	\$16.01	\$0.00	\$65.56
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 (ZONE 3)	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR	12/02/2019	\$32.25	\$8.10	\$14.78	\$0.00	\$55.13
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY)	12/01/2019	\$22.25	\$8.10	\$12.72	\$0.00	\$53.07
LABORERS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020	\$33.06	\$8.10 \$8.10	\$12.72	\$0.00	\$53.88
	12/01/2020	\$33.00	\$8.10	\$12.72	\$0.00	\$54.60
	06/01/2020	\$33.87	\$8.10 \$8.10	\$12.72	\$0.00	\$55.53
	12/01/2021	\$34.71	\$8.10 \$8.10	\$12.72	\$0.00	\$55.35 \$56.36
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	\$55.54	\$8.10	ψ12.72	\$0.00	\$50.50
ASBESTOS WORKER (PIPES & TANKS)	12/01/2019	\$33.30	\$12.50	\$8.35	\$0.00	\$54.15
HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	06/01/2020	\$34.20	\$12.50	\$8.35	\$0.00	\$55.05
	12/01/2020	\$35.10	\$12.50	\$8.35	\$0.00	\$55.95
ASPHALT RAKER LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY)	12/01/2019	\$31.75	\$8.10	\$12.72	\$0.00	\$52.57
LABORERS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020	\$32.56	\$8.10	\$12.72	\$0.00	\$53.38
	12/01/2020	\$33.37	\$8.10	\$12.72	\$0.00	\$54.19
	06/01/2021	\$34.21	\$8.10	\$12.72	\$0.00	\$55.03
	12/01/2021	\$35.04	\$8.10	\$12.72	\$0.00	\$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) OPERATING ENGINEERS LOCAL 98	12/01/2019	\$35.40	\$11.94	\$14.35	\$0.00	\$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATOR OPERATING ENGINEERS LOCAL 98	12/01/2019	\$35.40	\$11.94	\$14.35	\$0.00	\$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63
For apprentice rates see "Apprentice- LABORER"						
BATCH/CEMENT PLANT - ON SITE OPERATING ENGINEERS LOCAL 98	12/01/2019	\$34.87	\$11.94	\$14.35	\$0.00	\$61.16
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BLOCK PAVER, RAMMER / CURB SETTER LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$32.25	\$8.10	\$14.78	\$0.00	\$55.13
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY &	12/01/2019	\$32.25	\$8.10	\$12.72	\$0.00	\$53.07
HIGHWAY) LABORERS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020	\$33.06	\$8.10	\$12.72	\$0.00	\$53.88
	12/01/2020	\$33.87	\$8.10	\$12.72	\$0.00	\$54.69
	06/01/2021	\$34.71	\$8.10	\$12.72	\$0.00	\$55.53
	12/01/2021	\$35.54	\$8.10	\$12.72	\$0.00	\$56.36
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
BOILER MAKER BOILERMAKERS LOCAL 29	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

Apprentice - BOILERMAKER - Local 29

	Effecti	ive Date -	01/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	То	tal Rate
	1	65		\$29.97	\$7.07	\$11.69	\$0.00		\$48.73
	2	65		\$29.97	\$7.07	\$11.69	\$0.00		\$48.73
	3	70		\$32.27	\$7.07	\$12.59	\$0.00		\$51.93
	4	75		\$34.58	\$7.07	\$13.49	\$0.00		\$55.14
	5	80		\$36.88	\$7.07	\$14.38	\$0.00		\$58.33
	6	85		\$39.19	\$7.07	\$15.29	\$0.00		\$61.55
	7	90		\$41.49	\$7.07	\$16.18	\$0.00		\$64.74
	8	95		\$43.80	\$7.07	\$17.09	\$0.00		\$67.96
	Notes:								
	Appre	ntice to Jo	urneyworker Ratio:1:4						
BRICK/STONE	E/ARTII	FICIAL MA	ASONRY (INCL. MASONR	Y 08/01/2019	9 \$42.8	1 \$10.75	\$19.41	\$0.00	\$72.97
WATERPROO	FING) Cal 3 (Sp	RINGFIELD/	(PITTSFIELD)	02/01/2020	\$42.8	1 \$10.75	\$19.96	\$0.00	\$73.52
Briterillan Bio	0.111 0 (0.1			08/01/2020	9 \$44.1	6 \$10.75	\$20.11	\$0.00	\$75.02
				02/01/202	1 \$44.7	1 \$10.75	\$20.11	\$0.00	\$75.57
				08/01/202	1 \$46.1	1 \$10.75	\$20.27	\$0.00	\$77.13
				02/01/2022	2 \$46.6	4 \$10.75	\$20.27	\$0.00	\$77.66

	Enecu	ve Date -	08/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	e
	1	50		\$21.41	\$10.75	\$19.41	\$0.00	\$51.57	7
	2	60		\$25.69	\$10.75	\$19.41	\$0.00	\$55.85	5
	3	70		\$29.97	\$10.75	\$19.41	\$0.00	\$60.13	3
	4	80		\$34.25	\$10.75	\$19.41	\$0.00	\$64.41	l
	5	90		\$38.53	\$10.75	\$19.41	\$0.00	\$68.69)
	Effecti	ve Date -	02/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	e
	1	50		\$21.41	\$10.75	\$19.96	\$0.00	\$52.12	2
	2	60		\$25.69	\$10.75	\$19.96	\$0.00	\$56.40)
	3	70		\$29.97	\$10.75	\$19.96	\$0.00	\$60.68	3
	4	80		\$34.25	\$10.75	\$19.96	\$0.00	\$64.96	5
	5	90		\$38.53	\$10.75	\$19.96	\$0.00	\$69.24	1
	Notes:								
	İ							ĺ	
	Appre	ntice to Jou	urneyworker Ratio:1:5						
BULLDOZER/	POWER	SHOVEL/	TREE SHREDDER	12/01/2019	9 \$35.40	\$11.94	\$14.35	\$0.00	\$61.69
ENGINEERS LOCA. For apprentice	L 98 rates see "	/C	LAM SHELL <i>OPERATING</i> PPERATING ENGINEERS"						
CAISSON & UI	NDERP	INNING B	OTTOM MAN	12/01/2019	9 \$40.25	\$8.10	\$16.80	\$0.00	\$65.15
LABORERS - FOUN	IDATION .	AND MARINI	Ε	06/01/2020	9 \$41.24	\$8.10	\$16.80	\$0.00	\$66.14
				12/01/2020	\$42.22	\$8.10	\$16.80	\$0.00	\$67.12
				06/01/202	1 \$43.24	\$8.10	\$16.80	\$0.00	\$68.14
				12/01/202	1 \$44.25	\$8.10	\$16.80	\$0.00	\$69.15
For apprentice	rates see "	Apprentice- L	ABORER"						
LABORERS - FOUN	NDERP.	INNING L. AND MARINI	ABORER E	12/01/2019	9 \$39.10	\$8.10	\$16.80	\$0.00	\$64.00
				06/01/2020	9 \$40.09	\$8.10	\$16.80	\$0.00	\$64.99
				12/01/2020	9 \$41.07	\$8.10	\$16.80	\$0.00	\$65.97
				06/01/202	1 \$42.09	\$8.10	\$16.80	\$0.00	\$66.99
For apprentice	rates see "	Apprentice- L	ABORER"	12/01/202	1 \$43.10	\$8.10	\$16.80	\$0.00	\$68.00
CAISSON & UI	NDERP	INNING T	OP MAN	12/01/2010	9 \$39.10	\$8.10	\$16.80	\$0.00	\$64.00
LABORERS - FOUN	DATION	AND MARINE	E	06/01/201) \$40.09	\$8.10	\$16.80	\$0.00 \$0.00	\$64.00 \$64.99
				12/01/2020) \$41.07	\$8.10	\$16.80	\$0.00	\$65.97
				06/01/202	1 \$42.09	\$8.10	\$16.80	\$0.00	\$66.99
				12/01/202	1 \$43.10	\$8.10	\$16.80	\$0.00	\$68.00
For apprentice	rates see "	Apprentice- L	ABORER"	12,01,202.	φ.σ.10	<i>Q</i> 0.10			<i>400.00</i>
CARBIDE COR LABORERS - ZONE	RE DRIL 3 (Buille	LL OPERA	TOR	12/02/2019	9 \$31.75	\$8.10	\$14.78	\$0.00	\$54.63

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield 08/01/2019

For apprentice rates see "Apprentice- LABORER"

Supplemental **Total Rate** Classification Pension Effective Date Base Wage Health Unemployment CARPENTER \$0.00 09/02/2019 \$16.87 \$37.54 \$7.84 \$62.25 CARPENTERS LOCAL 336 - HAMPDEN HAMPSHIRE FRANKLIN \$16.87 \$0.00 03/01/2020 \$38.04 \$7.84 \$62.75 09/01/2020 \$38.54 \$7.84 \$16.87 \$0.00 \$63.25 03/01/2021 \$39.04 \$16.87 \$0.00 \$63.75 \$7.84 \$16.87 09/01/2021 \$39.54 \$7.84 \$0.00 \$64.25 \$16.87 \$0.00 03/01/2022 \$40.04 \$7.84 \$64.75 09/01/2022 \$40.54 \$7.84 \$16.87 \$0.00 \$65.25 \$16.87 \$0.00 03/01/2023 \$41.04 \$7.84 \$65.75

Apprentice - CARPENTER - Local 336 Hampden Hampshire Franklin

percent				Supplemental	
percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
50	\$18.77	\$7.84	\$1.32	\$0.00	\$27.93
60	\$22.52	\$7.84	\$1.32	\$0.00	\$31.68
70	\$26.28	\$7.84	\$12.91	\$0.00	\$47.03
75	\$28.16	\$7.84	\$12.91	\$0.00	\$48.91
80	\$30.03	\$7.84	\$14.23	\$0.00	\$52.10
80	\$30.03	\$7.84	\$14.23	\$0.00	\$52.10
90	\$33.79	\$7.84	\$15.55	\$0.00	\$57.18
90	\$33.79	\$7.84	\$15.55	\$0.00	\$57.18
	50 60 70 75 80 80 90 90	50 \$18.77 60 \$22.52 70 \$26.28 75 \$28.16 80 \$30.03 80 \$30.03 90 \$33.79 90 \$33.79	50\$18.77\$7.8460\$22.52\$7.8470\$26.28\$7.8475\$28.16\$7.8480\$30.03\$7.8480\$30.03\$7.8490\$33.79\$7.8490\$33.79\$7.84	50\$18.77\$7.84\$1.3260\$22.52\$7.84\$1.3270\$26.28\$7.84\$12.9175\$28.16\$7.84\$12.9180\$30.03\$7.84\$14.2380\$30.03\$7.84\$14.2390\$33.79\$7.84\$15.5590\$33.79\$7.84\$15.55	50\$18.77\$7.84\$1.32\$0.0060\$22.52\$7.84\$1.32\$0.0070\$26.28\$7.84\$12.91\$0.0075\$28.16\$7.84\$12.91\$0.0080\$30.03\$7.84\$14.23\$0.0080\$30.03\$7.84\$14.23\$0.0090\$33.79\$7.84\$15.55\$0.0090\$33.79\$7.84\$15.55\$0.00

Effect	tive Date - (03/01/2020				Supplemental		
Step	percent	Apprentice	Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$19.02	\$7.84	\$1.32	\$0.00	\$28.18	
2	60		\$22.82	\$7.84	\$1.32	\$0.00	\$31.98	
3	70		\$26.63	\$7.84	\$12.91	\$0.00	\$47.38	
4	75		\$28.53	\$7.84	\$12.91	\$0.00	\$49.28	
5	80		\$30.43	\$7.84	\$14.23	\$0.00	\$52.50	
6	80	5	\$30.43	\$7.84	\$14.23	\$0.00	\$52.50	
7	90		\$34.24	\$7.84	\$15.55	\$0.00	\$57.63	
8	90	S	\$34.24	\$7.84	\$15.55	\$0.00	\$57.63	
Notes	:							
	% Indenture	d After 10/1/17; 45/45/55/55/70/70/8	0/80				1	
	Step 1&2 \$2	26.05/3&4 \$31.09/5&6 \$48.35/7&8	\$53.42					
Appr	entice to Jour	neyworker Ratio:1:5						
CARPENTER WOOD CARPENTERS LOCAL 336 -	FRAME HAMPDEN HAM	IPSHIRE FRANKLIN	10/01/2019	\$23.49	\$7.07	\$7.86	\$0.00	\$38.42

All Aspects of New Wood Frame Work

Effectiv	ve Date - 10/01/2019				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	60	\$14.09	\$7.07	\$0.00	\$0.00	\$21.16
2	60	\$14.09	\$7.07	\$0.00	\$0.00	\$21.16
3	65	\$15.27	\$7.07	\$7.86	\$0.00	\$30.20
4	70	\$16.44	\$7.07	\$7.86	\$0.00	\$31.37
5	75	\$17.62	\$7.07	\$7.86	\$0.00	\$32.55
6	80	\$18.79	\$7.07	\$7.86	\$0.00	\$33.72
7	85	\$19.97	\$7.07	\$7.86	\$0.00	\$34.90
8	90	\$21.14	\$7.07	\$7.86	\$0.00	\$36.07
Notes:						
i i	% Indentured After 10/1/17; 45/45/5	5/55/70/70/80/80				
 	Step 1&2 \$17.64/ 3&4 \$24.74/ 5&6	\$31.37/ 7&8 \$33.72				
Apprei	ntice to Journeyworker Ratio:1:5					
CEMENT MASONRY/	PLASTERING	01/01/2020	\$41.94	\$12.70	\$17.64	\$0.62 \$72.90

Apprentice -	CARPENTER (Wood Frame) - 336 Hampden Hampshire
Effective Date	- 10/01/2019

BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)

Apprentice -	CEMENT MASONRY/PLASTERING - Springfield/Pittsfield
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	Effecti	ve Date - 01/01/202	20				Supplemental		
	Step	percent	Apprentice E	Base Wage	Health	Pension	Unemployment	Tot	al Rate
	1	50	\$2	20.97	\$12.70	\$15.41	\$0.00		\$49.08
	2	60	\$2	25.16	\$12.70	\$17.64	\$0.62		\$56.12
	3	65	\$2	27.26	\$12.70	\$17.64	\$0.62		\$58.22
	4	70	\$2	29.36	\$12.70	\$17.64	\$0.62		\$60.32
	5	75	\$3	31.46	\$12.70	\$17.64	\$0.62		\$62.42
	6	80	\$3	33.55	\$12.70	\$17.64	\$0.62		\$64.51
	7	90	\$3	37.75	\$12.70	\$17.64	\$0.62		\$68.71
	Notes:	Steps 3,4 are 500 hrs	. All other steps are 1,000 hrs.						
I	Appre	ntice to Journeywork	er Ratio:1:3						
CHAIN SAW O	PERAT 3 (BUILI	OR DING & SITE)		12/02/2019	\$31	.75 \$8.10	\$14.78	\$0.00	\$54.63
For apprentice r	ates see "	Apprentice- LABORER"							
COMPRESSOR OPERATING ENGIN	OPER.	ATOR DCAL 98		12/01/2019	\$34	.87 \$11.94	\$14.35	\$0.00	\$61.16
For apprentice r	ates see "	Apprentice- OPERATING I	ENGINEERS"						
CRANE OPERA OPERATING ENGIN	TOR	DCAL 98		12/01/2019	\$38	.90 \$11.94	\$14.35	\$0.00	\$65.19
For apprentice r	ates see "	Apprentice- OPERATING I	ENGINEERS"						
DELEADER (BI	RIDGE)		01/01/2020	\$50	.96 \$8.20	\$22.10	\$0.00	\$81.26
PAINTERS LOCAL 3	5 - ZONI	23		07/01/2020	\$52	.06 \$8.20	\$22.10	\$0.00	\$82.36
				01/01/2021	\$53	.16 \$8.20	\$22.10	\$0.00	\$83.46
Issue Date: 01	/29/202	20	Wage Request Number:	2020012	29-024				Page 6 of 33

Effectiv	ve Date - 01/01/2020				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$25.48	\$8.20	\$0.00	\$0.00	\$33.68
2	55	\$28.03	\$8.20	\$5.94	\$0.00	\$42.17
3	60	\$30.58	\$8.20	\$6.48	\$0.00	\$45.26
4	65	\$33.12	\$8.20	\$7.02	\$0.00	\$48.34
5	70	\$35.67	\$8.20	\$18.86	\$0.00	\$62.73
6	75	\$38.22	\$8.20	\$19.40	\$0.00	\$65.82
7	80	\$40.77	\$8.20	\$19.94	\$0.00	\$68.91
8	90	\$45.86	\$8.20	\$21.02	\$0.00	\$75.08

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

	Effecti Step	ve Date -	07/01/2020	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	To	otal Rate
	1	50		\$26.03	\$8.20	\$0.00	\$0.00		\$34.23
	2	55		\$28.63	\$8.20	\$5.94	\$0.00		\$42.77
	3	60		\$31.24	\$8.20	\$6.48	\$0.00		\$45.92
	4	65		\$33.84	\$8.20	\$7.02	\$0.00		\$49.06
	5	70		\$36.44	\$8.20	\$18.86	\$0.00		\$63.50
	6	75		\$39.05	\$8.20	\$19.40	\$0.00		\$66.65
	7	80		\$41.65	\$8.20	\$19.94	\$0.00		\$69.79
	8	90		\$46.85	\$8.20	\$21.02	\$0.00		\$76.07
	Notes:								
		Steps are	750 hrs.						
	Appre	ntice to Jo	urneyworker Ratio:1:1						
DEMO: ADZEN LABORERS - ZONE	MAN 3 (BUILI	DING & SITE)	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
For apprentice	rates see "	Apprentice- I	LABORER"						
DEMO: BACK	HOE/LO	DADER/H. DING & SITE	AMMER OPERATOR	12/01/2019	\$40.30	\$8.10	\$16.60	\$0.00	\$65.00
For apprentice	rates see "	Apprentice- I	LABORER"						
DEMO: BURN	ERS 3 (BUILI	DING & SITE)	12/01/2019	\$40.05	\$8.10	\$16.60	\$0.00	\$64.75
For apprentice	rates see "	Apprentice- I	LABORER"						
DEMO: CONCL	RETE C 3 <i>(Buill</i>	UTTER/S. DING & SITE	AWYER	12/01/2019	\$40.30	\$8.10	\$16.60	\$0.00	\$65.00
For apprentice	rates see "	Apprentice- I	LABORER"						
DEMO: JACKH LABORERS - ZONE	IAMME 3 (Buill	ER OPERA	ATOR	12/01/2019	\$40.05	\$8.10	\$16.60	\$0.00	\$64.75
For apprentice	rates see "	Apprentice- I	LABORER"						
DEMO: WREC LABORERS - ZONE	KING L 3 (BUILI	ABORER)	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
For apprentice	rates see "	Apprentice- I	LABORER"						
DIVER PILE DRIVER LOC	AL 56 (ZC	ONE 3)		08/01/2019	\$68.52	\$9.90	\$21.15	\$0.00	\$99.57

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemplovment	Total Rate
For apprentice rates see "Apprentice- PILE DRIVER"					•	
DIVER TENDER	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
PILE DRIVER LOCAL 56 (ZONE 3)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT)	08/01/2019	\$73.41	\$9.90	\$21.15	\$0.00	\$104.46
PILE DRIVER LOCAL 56 (ZONE 3)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT)	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
PILE DRIVER LOCAL 56 (ZONE 3)	• • • • • • • • • • •					+
For apprentice rates see "Apprentice- PILE DRIVER"						
ELECTRICIAN (Including Core Drilling) ELECTRICIANS LOCAL 7	12/29/2019	\$43.41	\$11.00	\$12.60	\$0.00	\$67.01

Apprentice - ELECTRICIAN - Local 7

Effective	e Date - 12/29/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	40	\$17.36	\$6.00	\$0.52	\$0.00	\$23.88	
2	45	\$19.53	\$6.00	\$0.59	\$0.00	\$26.12	
3	50	\$21.71	\$11.00	\$6.95	\$0.00	\$39.66	
4	55	\$23.88	\$11.00	\$7.02	\$0.00	\$41.90	
5	65	\$28.22	\$11.00	\$8.15	\$0.00	\$47.37	
6	70	\$30.39	\$11.00	\$9.21	\$0.00	\$50.60	
Notes:							
	Steps 1-2 are 1000 hrs; Steps 3-6 are 1	500 hrs.					
Apprent	tice to Journeyworker Ratio:2:3****						
ELEVATOR CONSTRU	CTOR	01/01/2020	\$54.85	\$15.73	\$18.41	\$0.00	\$88.99
ELEVATOR CONSTRUCTORS	LOCAL 41	01/01/2021	\$56.69	\$15.88	\$19.31	\$0.00	\$91.88
		01/01/2022	\$58.62	\$16.03	\$20.21	\$0.00	\$94.86

	Effective Date - 01/01/2020					Supplemental			
	Step	percent	<i>I</i>	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$27.43	\$15.73	\$0.00	\$0.00	\$43.16	
	2	55		\$30.17	\$15.73	\$18.41	\$0.00	\$64.31	
	3	65		\$35.65	\$15.73	\$18.41	\$0.00	\$69.79	
	4	70		\$38.40	\$15.73	\$18.41	\$0.00	\$72.54	
	5	80		\$43.88	\$15.73	\$18.41	\$0.00	\$78.02	
	Effecti	ve Date -	01/01/2021				Supplemental		
	Step	percent	A	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$28.35	\$15.88	\$0.00	\$0.00	\$44.23	
	2	55		\$31.18	\$15.88	\$19.31	\$0.00	\$66.37	
	3	65		\$36.85	\$15.88	\$19.31	\$0.00	\$72.04	
	4	70		\$39.68	\$15.88	\$19.31	\$0.00	\$74.87	
	5	80		\$45.35	\$15.88	\$19.31	\$0.00	\$80.54	
	Notes:								
		Steps 1-2	are 6 mos.; Steps 3-5 are 1 ye	ar					
			urneyworker Ratio:1:1						
		ICTOP HI		0.1 /0.1 / 0 .0 0		<u> </u>	¢10.41		
ELEVATOR CONST	RUCTOR	S LOCAL 41		01/01/2020) \$38.40	\$15.73	\$18.41	\$0.00	\$72.54
				01/01/2021	1 \$39.68	\$15.88	\$19.31	\$0.00	\$74.87
For apprentice	rates see "	Apprentice - I	ELEVATOR CONSTRUCTOR"	01/01/2022	2 \$41.03	\$16.03	\$20.21	\$0.00	\$77.27
FENCE & GUA	RD RA	IL ERECT	OR (HEAVY & HIGHWAY)	12/01/2019	9 \$31.75	\$8.10	\$12.72	\$0.00	\$52.57
LABORERS - ZONE	3 (HEAV	Y & HIGHWA	Y)	06/01/2020	\$32.56	\$8.10	\$12.72	\$0.00	\$53.38
				12/01/2020) \$33.37	\$8.10	\$12.72	\$0.00	\$54.19
				06/01/2021	1 \$34.21	\$8.10	\$12.72	\$0.00	\$55.03
				12/01/2021	1 \$35.04	\$8.10	\$12.72	\$0.00	\$55.86
For apprentice	rates see "	Apprentice- L	ABORER (Heavy and Highway)						
FIELD ENG.IN OPERATING ENGIN	ST/ROI NEERS LC	D-BLDG,S DCAL 98	ITE,HVY/HWY	06/01/1999	9 \$18.84	\$4.80	\$4.10	\$0.00	\$27.74
FIELD ENG.PA	ARTY C	HIEF:BLD DCAL 98	G,SITE,HVY/HWY	06/01/1999	9 \$21.33	\$4.80	\$4.10	\$0.00	\$30.23
FIELD ENG.SU	JRVEY NEERS LC	CHIEF-BL DCAL 98	DG,SITE,HVY/HWY	06/01/1999	9 \$22.33	\$4.80	\$4.10	\$0.00	\$31.23
FIRE ALARM I	INSTAL CAL 7	LER		12/29/2019	9 \$43.41	\$11.00	\$12.60	\$0.00	\$67.01
For apprentice	rates see "	Apprentice- E	LECTRICIAN"						
FIRE ALARM I	REPAIR	/ MAINT	ENANCE ISSIONING <i>electricians</i>	12/29/2019	9 \$43.41	\$11.00	\$12.60	\$0.00	\$67.01
LOCAL 7	rates see "	Annrentice T	EI ECOMMUNICATIONS TECHNI	CIAN"					
FIREMAN		sprenuce- 1		12/01/201/			¢1125	\$0.00	¢(1.1)
OPERATING ENGL	NEERS LC	OCAL 98		12/01/2019	9 \$34.87	\$11.94	\$14.33	20.00	\$61.16

Apprentice - ELEVATOR CONSTRUCTOR - Local 41

	Effecti	ve Date - 12/01/2019					Supplemental		
	Step	percent	Apprentic	e Base Wage	Health	Pension	Unemployment	Total R	ate
	1	60		\$20.92	\$11.94	\$14.35	\$0.00	\$47	.21
	2	70		\$24.41	\$11.94	\$14.35	\$0.00	\$50	.70
	3	80		\$27.90	\$11.94	\$14.35	\$0.00	\$54	.19
	4	90		\$31.38	\$11.94	\$14.35	\$0.00	\$57	.67
	Notes:	Steps 1-2 are 1000 hrs.; 5	Steps 3-4 are 2000 hrs.						-
	Appre	ntice to Journeyworker F	Ratio:1:6						
FLAGGER & S	IGNAL	ER (HEAVY & HIGHWA	AY)	12/01/2019	9 \$23.50	\$8.10	\$12.72	\$0.00	\$44.32
LABORERS - ZONE	3 (HEAV	Y & HIGHWAY)		06/01/2020	\$23.50	\$8.10	\$12.72	\$0.00	\$44.32
				12/01/2020	\$24.50	\$8.10	\$12.72	\$0.00	\$45.32
				06/01/202	1 \$24.50	\$8.10	\$12.72	\$0.00	\$45.32
				12/01/202	1 \$24.50	\$8.10	\$12.72	\$0.00	\$45.32
For apprentice	rates see '	Apprentice- LABORER (Heavy	and Highway)						
FLOORCOVER	ER	2168 ZONE III		09/01/2019	9 \$37.44	\$7.84	\$16.87	\$0.00	\$62.15

Apprentice - OPERATING ENGINEERS - Local 98 Class 3

Apprentice - FLOORCOVERER - Local 2168 Zone III

Effe	ctive Date - 09/01/201	9			Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total R	ate
1	50	\$18.72	\$7.84	\$1.32	\$0.00	\$27.	88
2	55	\$20.59	\$7.84	\$1.32	\$0.00	\$29.	75
3	60	\$22.46	\$7.84	\$12.91	\$0.00	\$43.	21
4	65	\$24.34	\$7.84	\$12.91	\$0.00	\$45.	09
5	70	\$26.21	\$7.84	\$14.23	\$0.00	\$48.	28
6	75	\$28.08	\$7.84	\$14.23	\$0.00	\$50.	15
7	80	\$29.95	\$7.84	\$15.55	\$0.00	\$53.	34
8	85	\$31.82	\$7.84	\$15.55	\$0.00	\$55.	21
Note	 Steps are 750 hrs. % After 09/1/17; 45/4 Step 1&2 \$26.01/ 3& 	5/55/55/70/70/80/80 (1500hr Steps) 4 \$31.03/ 5&6 \$48.28/ 7&8 \$53.34					
Арр	rentice to Journeywork	er Ratio:1:1					_
FORK LIFT OPERATING ENGINEERS	LOCAL 98	12/01/201	9 \$35.09	\$11.94	\$14.35	\$0.00	\$61.38
For apprentice rates se	ee "Apprentice- OPERATING E	NGINEERS"					
GENERATORS/LIG	HTING PLANTS LOCAL 98	12/01/201	9 \$31.64	\$11.94	\$14.35	\$0.00	\$57.93
For apprentice rates se	ee "Apprentice- OPERATING E	NGINEERS"					
GLAZIER (GLASS P	LANK/AIR BARRIER/	NTERIOR 06/01/201	9 \$38.18	\$10.60	\$9.90	\$0.00	\$58.68
SYSTEMS) GLAZIERS LOCAL 1333		06/01/202	0 \$39.18	\$10.80	\$10.45	\$0.00	\$60.43
Issue Date: 01/29/2	2020	Wage Request Number: 202001	29-024				Page 10 of 33

Effecti	ve Date -	06/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$19.09	\$10.60	\$1.80	\$0.00	\$31.49	
2	56		\$21.48	\$10.60	\$1.80	\$0.00	\$33.88	
3	63		\$23.86	\$10.60	\$2.40	\$0.00	\$36.86	
4	69		\$26.25	\$10.60	\$2.40	\$0.00	\$39.25	
5	75		\$28.64	\$10.60	\$2.90	\$0.00	\$42.14	
6	81		\$31.02	\$10.60	\$2.90	\$0.00	\$44.52	
7	88		\$33.41	\$10.60	\$9.90	\$0.00	\$53.91	
8	94		\$35.79	\$10.60	\$9.90	\$0.00	\$56.29	

Apprentice -	GLAZIER - Local 1333
Effective Date	06/01/2019

Dee	. D (01/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Ra	ate
1	50	\$19.59	\$10.80	\$1.80	\$0.00	\$32.	19
2	56	\$22.04	\$10.80	\$1.80	\$0.00	\$34.	64
3	63	\$24.49	\$10.80	\$2.45	\$0.00	\$37.	74
4	69	\$26.94	\$10.80	\$2.45	\$0.00	\$40.	19
5	75	\$29.39	\$10.80	\$3.15	\$0.00	\$43.	34
6	81	\$31.83	\$10.80	\$3.15	\$0.00	\$45.	78
7	88	\$34.28	\$10.80	\$10.45	\$0.00	\$55.	53
8	94	\$36.73	\$10.80	\$10.45	\$0.00	\$57.	98
Notes	:						
Appr	entice to Journeyworker	Ratio:1:3					
GRADER/TRENCHIN OPERATING ENGINEERS I	JG MACHINE/DERRICK LOCAL 98	12/01/2019	\$35.40	\$11.94	\$14.35	\$0.00	\$61.69
For apprentice rates see	"Apprentice- OPERATING ENC	INEERS"					
HVAC (DUCI WORK SHEETMETAL WORKERS I	.) LOCAL 63	01/01/2020	\$36.99	\$10.64	\$16.22	\$1.77	\$65.62
For apprentice rates see	"Apprentice- SHEET METAL W	ORKER"					
HVAC (ELECTRICAL ELECTRICIANS LOCAL 7	L CONTROLS)	12/29/2019	\$43.41	\$11.00	\$12.60	\$0.00	\$67.01
For apprentice rates see	"Apprentice- ELECTRICIAN"						
HVAC (TESTING AN SHEETMETAL WORKERS I	D BALANCING - AIR) .OCAL 63	01/01/2020	\$36.99	\$10.64	\$16.22	\$1.77	\$65.62
For apprentice rates see	"Apprentice- SHEET METAL W	ORKER"					

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER)	09/17/2019	\$41.21	\$8.75	\$16.35	\$0.00	\$66.31
PLUMBERS & PIPEFITTERS LOCAL 104	03/17/2020	\$42.21	\$8.75	\$16.35	\$0.00	\$67.31
	09/17/2020	\$43.21	\$8.75	\$16.35	\$0.00	\$68.31
	03/17/2021	\$44.21	\$8.75	\$16.35	\$0.00	\$69.31
	09/17/2021	\$45.21	\$8.75	\$16.35	\$0.00	\$70.31
	03/17/2022	\$46.46	\$8.75	\$16.35	\$0.00	\$71.56
	09/17/2022	\$47.46	\$8.75	\$16.35	\$0.00	\$72.56
	03/17/2023	\$48.71	\$8.75	\$16.35	\$0.00	\$73.81
	09/17/2023	\$49.71	\$8.75	\$16.35	\$0.00	\$74.81
	03/17/2024	\$50.96	\$8.75	\$16.35	\$0.00	\$76.06
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 104	09/17/2019	\$41.21	\$8.75	\$16.35	\$0.00	\$66.31
	03/17/2020	\$42.21	\$8.75	\$16.35	\$0.00	\$67.31
	09/17/2020	\$43.21	\$8.75	\$16.35	\$0.00	\$68.31
	03/17/2021	\$44.21	\$8.75	\$16.35	\$0.00	\$69.31
	09/17/2021	\$45.21	\$8.75	\$16.35	\$0.00	\$70.31
	03/17/2022	\$46.46	\$8.75	\$16.35	\$0.00	\$71.56
	09/17/2022	\$47.46	\$8.75	\$16.35	\$0.00	\$72.56
	03/17/2023	\$48.71	\$8.75	\$16.35	\$0.00	\$73.81
	09/17/2023	\$49.71	\$8.75	\$16.35	\$0.00	\$74.81
	03/17/2024	\$50.96	\$8.75	\$16.35	\$0.00	\$76.06
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY)	12/01/2019	\$32.25	\$8.10	\$12.72	\$0.00	\$53.07
	06/01/2020	\$33.06	\$8.10	\$12.72	\$0.00	\$53.88
	12/01/2020	\$33.87	\$8.10	\$12.72	\$0.00	\$54.69
	06/01/2021	\$34.71	\$8.10	\$12.72	\$0.00	\$55.53
Description and the Managerian LADODED (II. and and II. have)	12/01/2021	\$35.54	\$8.10	\$12.72	\$0.00	\$56.36
INSULATOR (DIDES & TANKS)	00/04/2011	**		ф1 с 4 с	#0.0C	
HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	09/01/2019	\$38.75	\$12.80	\$16.40	\$0.00	\$67.95

Apprentice -	ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Springfield
	00/01/2010

Effecti	ve Date - 09/01/	2019			Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$19.38	\$12.80	\$11.90	\$0.00	\$44.08	
2	60	\$23.25	\$12.80	\$12.80	\$0.00	\$48.85	
3	70	\$27.13	\$12.80	\$13.70	\$0.00	\$53.63	
4	80	\$31.00	\$12.80	\$14.60	\$0.00	\$58.40	
Notos							
Trotes.	Steps are 1 year						
	Steps are 1 year						
<u> </u>	··· · ·						

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
IRONWORKER/WELDER	09/16/2019	\$35.10	\$8.00	\$20.75	\$0.00	\$63.85
RONWORKERS LOCAL 7 (SPRINGFIELD AREA)	03/16/2020	\$35.95	\$8.00	\$20.75	\$0.00	\$64.70
	09/16/2020	\$36.85	\$8.00	\$20.75	\$0.00	\$65.60
	03/16/2021	\$37.70	\$8.00	\$20.75	\$0.00	\$66.45

Apprentice - IRONWORKER - Local 7 Springfield

Effecti	ve Date - 09/16/2019	19			Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	60	\$21.06	\$8.00	\$20.75	\$0.00	\$49.81
2	70	\$24.57	\$8.00	\$20.75	\$0.00	\$53.32
3	75	\$26.33	\$8.00	\$20.75	\$0.00	\$55.08
4	80	\$28.08	\$8.00	\$20.75	\$0.00	\$56.83
5	85	\$29.84	\$8.00	\$20.75	\$0.00	\$58.59
6	90	\$31.59	\$8.00	\$20.75	\$0.00	\$60.34

Effect	ive Date - 03/16/2020			Supplemental			
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Тс	otal Rate
1	60	\$21.57	\$8.00	\$20.75	\$0.00		\$50.32
2	70	\$25.17	\$8.00	\$20.75	\$0.00		\$53.92
3	75	\$26.96	\$8.00	\$20.75	\$0.00		\$55.71
4	80	\$28.76	\$8.00	\$20.75	\$0.00		\$57.51
5	85	\$30.56	\$8.00	\$20.75	\$0.00		\$59.31
6	90	\$32.36	\$8.00	\$20.75	\$0.00		\$61.11
Notes							
	Structural 1:6; Ornamental 1:4						
Appre	entice to Journeyworker Ratio:						
JACKHAMMER & PA LABORERS - ZONE 3 (BUIL	VING BREAKER OPERATOR DING & SITE)	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63
For apprentice rates see	"Apprentice- LABORER"						
LABORER		12/02/2019	\$31.50	\$8.10	\$14.78	\$0.00	\$54.38

LABORER LABORERS - ZONE 3 (BUILDING & SITE)

Apprentice - LABORER - Zone 3 Building & Site Effective Date - 12/02/2019 Supplemental											
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate					
1	60	\$18.90	\$8.10	\$14.78	\$0.00	\$41.78					
2	70	\$22.05	\$8.10	\$14.78	\$0.00	\$44.93					
3	80	\$25.20	\$8.10	\$14.78	\$0.00	\$48.08					
4	90	\$28.35	\$8.10	\$14.78	\$0.00	\$51.23					
Notes:											

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER (HEAVY & HIGHWAY)	12/01/2019	Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate 12/01/2019 \$31.50 \$8.10 \$12.72 \$0.00 \$52.32 06/01/2020 \$32.31 \$8.10 \$12.72 \$0.00 \$53.13 12/01/2020 \$33.12 \$8.10 \$12.72 \$0.00 \$53.94 06/01/2021 \$33.96 \$8.10 \$12.72 \$0.00 \$54.78 12/01/2021 \$34.79 \$8.10 \$12.72 \$0.00 \$55.61	\$0.00	\$52.32		
LABOREKS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020		\$53.13			
	12/01/2020	\$33.12	\$8.10	\$12.72	\$0.00	\$53.94
	06/01/2021	\$33.96	\$8.10	\$12.72	\$0.00	\$54.78
	12/01/2021	\$34.79	\$8.10	\$12.72	\$0.00	\$55.61

Apprentice - LABORER (Heavy & Highway) - Zone 3

	Effecti	ve Date -	12/01/2019				Supplemental			
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Tota	al Rate	
	1	60		\$18.90	\$8.10	\$12.72	\$0.00		\$39.72	
	2	70		\$22.05	\$8.10	\$12.72	\$0.00	5	\$42.87	
	3	80		\$25.20	\$8.10	\$12.72	\$0.00	5	\$46.02	
	4	90		\$28.35	\$8.10	\$12.72	\$0.00	5	\$49.17	
	Effecti	ve Date -	06/01/2020				Supplemental			
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Tota	al Rate	
	1	60		\$19.39	\$8.10	\$12.72	\$0.00		\$40.21	
	2	70		\$22.62	\$8.10	\$12.72	\$0.00		\$43.44	
	3	80		\$25.85	\$8.10	\$12.72	\$0.00		\$46.67	
	4	90		\$29.08	\$8.10	\$12.72	\$0.00	5	\$49.90	
	Notes:									
	Appre	ntice to Jo	urneyworker Ratio:1:5							
LABORER: CA	RPENT	TER TEND	ER	12/02/2019	\$31.50	\$8.10	\$14.78	\$0.00		\$54.38
For apprentice i	rates see "	'Apprentice- I	ABORER"							
LABORER: CE	MENT	FINISHER	TENDER	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00		\$54.63
For apprentice i	rates see "	'Apprentice- I	ABORER"							
LABORER: HA	ZARD	OUS WAS	TE/ASBESTOS REMOVER	12/01/2019	831.60	\$8.10	\$14.78	\$0.00		\$54.48
LABORERS - ZONE	3 (BUILL	DING & SITE))	12,01,201,	ψυ1.00	φ0.10	÷, •			<i>\$5</i> 1.10
For apprentice i	rates see "	Apprentice- I	ABORER"							
LABORER: MA	ASON T	ENDER		12/02/2019	\$32.50	\$8.10	\$14.78	\$0.00		\$55.38
For apprentice 1	rates see "	Apprentice- I	ABORER"							
LABORER: MA	ASON T	ENDER (H	HEAVY & HIGHWAY)	12/01/2010	\$21.75	\$8.10	\$12.72	\$0.00		\$52.57
LABORERS - ZONE	3 (HEAV	Y & HIGHWA	(Y)	06/01/2019	\$32.75 \$32.56	\$8.10	\$12.72	\$0.00		\$52.57
				12/01/2020	$(-1)^{-1}$	\$0.10 \$0.10	\$12.72	\$0.00		\$55.56
				06/01/2020	\$33.37 \$34.21	\$8.10	\$12.72	\$0.00		\$55.03
				12/01/2021	\$35.04	\$8.10	\$12.72	\$0.00		\$55.05
For apprentice a	rates see "	Apprentice- I	ABORER (Heavy and Highway)	12/01/2021	\$55.0 4	\$6.10	$\psi_1 z_1 z_2$	φ0.00		\$55.80
LABORER: MU LABORERS - ZONE	JLTI-TI 3 <i>(BUILI</i>	RADE TEN DING & SITE	NDER	12/02/2019	\$31.50	\$8.10	\$14.78	\$0.00		\$54.38
For apprentice	rates see "	Apprentice- I	ABORER"							
LABORER: TR	EE REN 3 (BUILI	MOVER DING & SITE	1	12/02/2019	\$31.50	\$8.10	\$14.78	\$0.00		\$54.38

Issue Date: 01/29/2020

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
This classification applies to all tree work associated with the removal of standing trees, a a utility company for the purpose of operation, maintenance or repair of utility company of	and trimming and ren equipment. For appre	noval of branches entice rates see "A	s and limbs wh Apprentice- LA	en the work is BORER"	s not done for	
LASER BEAM OPERATOR LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY)	12/01/2019	\$31.75	\$8.10	\$12.72	\$0.00	\$52.57
LABORERS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020	\$32.56	\$8.10	\$12.72	\$0.00	\$53.38
	12/01/2020	\$33.37	\$8.10	\$12.72	\$0.00	\$54.19
	06/01/2021	\$34.21	\$8.10	\$12.72	\$0.00	\$55.03
	12/01/2021	\$35.04	\$8.10	\$12.72	\$0.00	\$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
MARBLE & TILE FINISHERS	08/01/2019	\$35.17	\$10.75	\$18.87	\$0.00	\$64.79
BRICKLAYERS LOCAL 3 (SPRIPIII) - MARBLE & IILE	02/01/2020	\$35.17	\$10.75	\$19.37	\$0.00	\$65.29
	08/01/2020	\$36.17	\$10.75	\$19.49	\$0.00	\$66.41
	02/01/2021	\$36.67	\$10.75	\$19.49	\$0.00	\$66.91
	08/01/2021	\$37.67	\$10.75	\$19.62	\$0.00	\$68.04
	02/01/2022	\$38.12	\$10.75	\$19.62	\$0.00	\$68.49

Apprentice - MARBLE-TILE FINISHER-Local 3 Marble/Tile (Spr/Pitt)

Effective Date -		08/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$17.59	\$10.75	\$18.87	\$0.00	\$47.21	
2	60		\$21.10	\$10.75	\$18.87	\$0.00	\$50.72	
3	70		\$24.62	\$10.75	\$18.87	\$0.00	\$54.24	
4	80		\$28.14	\$10.75	\$18.87	\$0.00	\$57.76	
5	90		\$31.65	\$10.75	\$18.87	\$0.00	\$61.27	

50 60	 Apprentice Base Wage \$17.59	Health	Pension	Unemployment	Total Rate
50 60	\$17.59	\$10.75	¢10.07		
60		\$10.75	\$19.37	\$0.00	\$47.71
	\$21.10	\$10.75	\$19.37	\$0.00	\$51.22
70	\$24.62	\$10.75	\$19.37	\$0.00	\$54.74
80	\$28.14	\$10.75	\$19.37	\$0.00	\$58.26
90	\$31.65	\$10.75	\$19.37	\$0.00	\$61.77

Apprentice to Journeyworker Ratio:1:5

MARBLE MASON/TILE LAYER(SP/PT)SeeBrick

BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE

See "BRICK/STONE/ARTIFICIAL MASONRY(INCL.MASONRY WATERPROOFING)

MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 98	12/01/2019	\$35.40	\$11.94	\$14.35	\$0.00	\$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANIC/WELDER/BOOM TRUCK OPERATING ENGINEERS LOCAL 98	12/01/2019	\$34.87	\$11.94	\$14.35	\$0.00	\$61.16
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MILLWRIGHT (Zone 3)	04/01/2019	\$37.11	\$9.90	\$18.50	\$0.00	\$65.51
MILLWRIGHTS LOCAL 1121 - Zone 3			42.02			

	Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Tot	al Rate	
	1	55	\$20.41	\$9.90	\$5.31	\$0.00		\$35.62	
	2	65	\$24.12	\$9.90	\$15.13	\$0.00		\$49.15	
	3	75	\$27.83	\$9.90	\$16.10	\$0.00		\$53.83	
	4	85	\$31.54	\$9.90	\$17.06	\$0.00		\$58.50	
	Notes:								
		Steps are 2,000 hours							
	Appre	entice to Journeyworker Ratio:1:5							
MORTAR MIX	ER <i>3 (BUILI</i>	DING & SITE)	12/02/2019	9 \$31.75	\$8.10	\$14.78	\$0.00	\$54.63	
For apprentice r	rates see '	"Apprentice- LABORER"							
OILER OPERATING ENGIN	NEERS LO	OCAL 98	12/01/2019	9 \$30.56	\$11.94	\$14.35	\$0.00	\$56.85	
For apprentice r	rates see '	"Apprentice- OPERATING ENGINEERS"							
OTHER POWED	R DRIV	VEN EQUIPMENT - CLASS VI OCAL 98	12/01/2019	9 \$28.58	\$11.94	\$14.35	\$0.00	\$54.87	
For apprentice r	rates see '	"Apprentice- OPERATING ENGINEERS"							
PAINTER (BRI	DGES/	TANKS)	01/01/2020) \$50.96	\$8.20	\$22.10	\$0.00	\$81.26	
PAINTERS LOCAL 3	55 - ZON	E 3	07/01/2020	\$52.06	\$8.20	\$22.10	\$0.00	\$82.36	
			01/01/202	\$53.16	\$8.20	\$22.10	\$0.00	\$83.46	

Apprentice - MILLWRIGHT - Local 1121 Zone 3

Effectiv	re Date - 01/01/2020				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$25.48	\$8.20	\$0.00	\$0.00	\$33.68
2	55	\$28.03	\$8.20	\$5.94	\$0.00	\$42.17
3	60	\$30.58	\$8.20	\$6.48	\$0.00	\$45.26
4	65	\$33.12	\$8.20	\$7.02	\$0.00	\$48.34
5	70	\$35.67	\$8.20	\$18.86	\$0.00	\$62.73
6	75	\$38.22	\$8.20	\$19.40	\$0.00	\$65.82
7	80	\$40.77	\$8.20	\$19.94	\$0.00	\$68.91
8	90	\$45.86	\$8.20	\$21.02	\$0.00	\$75.08

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date -	07/01/2020

Effe	ective Date - 07/01/2020				Supplemental			
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate		
1	50	\$26.03	\$8.20	\$0.00	\$0.00	\$34.23		
2	55	\$28.63	\$8.20	\$5.94	\$0.00	\$42.77		
3	60	\$31.24	\$8.20	\$6.48	\$0.00	\$45.92		
4	65	\$33.84	\$8.20	\$7.02	\$0.00	\$49.06		
5	70	\$36.44	\$8.20	\$18.86	\$0.00	\$63.50		
6	75	\$39.05	\$8.20	\$19.40	\$0.00	\$66.65		
7	80	\$41.65	\$8.20	\$19.94	\$0.00	\$69.79		
8	90	\$46.85	\$8.20	\$21.02	\$0.00	\$76.07		
Note	es: Steps are 750 hrs.							
App	orentice to Journeyworker Ratio	p:1:1						
PAINTER (SIGN, PI PAINTERS LOCAL 35 - ZO	CTORIAL & DISPLAY) ONE 3	06/01/2013	\$25.81	\$7.07	\$7.05	\$0.00 \$	39.93	

	Effecti	ve Date - 06/01/2013				Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50	\$12.91	\$7.07	\$0.00	\$0.00	\$19.98	
	2	55	\$14.20	\$7.07	\$2.45	\$0.00	\$23.72	
	3	60	\$15.49	\$7.07	\$2.45	\$0.00	\$25.01	
	4	65	\$16.78	\$7.07	\$2.45	\$0.00	\$26.30	
	5	70	\$18.07	\$7.07	\$7.05	\$0.00	\$32.19	
	6	75	\$19.36	\$7.07	\$7.05	\$0.00	\$33.48	
	7	80	\$20.65	\$7.07	\$7.05	\$0.00	\$34.77	
	8	85	\$21.94	\$7.07	\$7.05	\$0.00	\$36.06	
	9	90	\$23.23	\$7.07	\$7.05	\$0.00	\$37.35	
	Notes:	Steps are 4 mos.						
	Appre	ntice to Journeyworker Ratio:1:1						
PAINTER (SPR	AY OR	SANDBLAST, NEW) *	01/01/2020	\$34.33	\$8.20	\$18.20	\$0.00	\$60.73
* If 30% or more of surfaces to be painted are new construction,		on, 07/01/2020	\$35.43	\$8.20	\$18.20	\$0.00	\$61.83	
112 W punt late	Shan Oc	used. I MINIERS LOCAL JJ - LONE J	01/01/202	\$36.53	\$8.20	\$18.20	\$0.00	\$62.93

Apprentice -	PAINTER SIGN - Local 35 Zone 3
Effective Date	- 06/01/2013

Effectiv	ve Date - 01/01/2020				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$17.17	\$8.20	\$0.00	\$0.00	\$25.37
2	55	\$18.88	\$8.20	\$3.80	\$0.00	\$30.88
3	60	\$20.60	\$8.20	\$4.14	\$0.00	\$32.94
4	65	\$22.31	\$8.20	\$4.49	\$0.00	\$35.00
5	70	\$24.03	\$8.20	\$16.13	\$0.00	\$48.36
6	75	\$25.75	\$8.20	\$16.48	\$0.00	\$50.43
7	80	\$27.46	\$8.20	\$16.82	\$0.00	\$52.48
8	90	\$30.90	\$8.20	\$17.51	\$0.00	\$56.61

Apprentice -	PAINTER Local 35 Zone 3 - Spray/Sandblast - New
	01/01/2020

Effective Date -	07/01/2020

	Effecti	ive Date - 07/01/2020			Supplemental			
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	t To	tal Rate
	1	50	\$17.72	\$8.20	\$0.00	\$0.00		\$25.92
	2	55	\$19.49	\$8.20	\$3.80	\$0.00)	\$31.49
	3	60	\$21.26	\$8.20	\$4.14	\$0.00)	\$33.60
	4	65	\$23.03	\$8.20	\$4.49	\$0.00)	\$35.72
	5	70	\$24.80	\$8.20	\$16.13	\$0.00)	\$49.13
	6	75	\$26.57	\$8.20	\$16.48	\$0.00	1	\$51.25
	7	80	\$28.34	\$8.20	\$16.82	\$0.00)	\$53.36
	8	90	\$31.89	\$8.20	\$17.51	\$0.00)	\$57.60
	Notes:							— — I
		Steps are 750 hrs.						
	Appre	ntice to Journeyworker Ratio:1:1						
PAINTER (SPR	AY OR	SANDBLAST, REPAINT)	01/01/2020	\$31.65	\$8.20	\$18.20	\$0.00	\$58.05
PAINTERS LOCAL 3	35 - ZONI	E 3	07/01/2020	\$32.75	\$8.20	\$18.20	\$0.00	\$59.15
			01/01/2021	\$33.85	\$8.20	\$18.20	\$0.00	\$60.25

Effecti	ve Date - 01/01/2020	5				
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$15.83	\$8.20	\$0.00	\$0.00	\$24.03
2	55	\$17.41	\$8.20	\$3.80	\$0.00	\$29.41
3	60	\$18.99	\$8.20	\$4.14	\$0.00	\$31.33
4	65	\$20.57	\$8.20	\$4.49	\$0.00	\$33.26
5	70	\$22.16	\$8.20	\$16.13	\$0.00	\$46.49
6	75	\$23.74	\$8.20	\$16.48	\$0.00	\$48.42
7	80	\$25.32	\$8.20	\$16.82	\$0.00	\$50.34
8	90	\$28.49	\$8.20	\$17.51	\$0.00	\$54.20

Apprentice -	PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint
Effective Dete	01/01/2020

Effective Date -	07/01/2020

Eff	ective Date - 07/01/2020				Supplemental		
Ste	p percent	Apprentice Base Wage	Health	Pension	Unemployment	Total	Rate
1	50	\$16.38	\$8.20	\$0.00	\$0.00	\$	24.58
2	55	\$18.01	\$8.20	\$3.80	\$0.00	\$	30.01
3	60	\$19.65	\$8.20	\$4.14	\$0.00	\$	31.99
4	65	\$21.29	\$8.20	\$4.49	\$0.00	\$	33.98
5	70	\$22.93	\$8.20	\$16.13	\$0.00	\$	47.26
6	75	\$24.56	\$8.20	\$16.48	\$0.00	\$	49.24
7	80	\$26.20	\$8.20	\$16.82	\$0.00	\$	51.22
8	90	\$29.48	\$8.20	\$17.51	\$0.00	\$	55.19
Not	tes:						·
	Steps are 750 hrs.						
Ap	prentice to Journeyworker R	atio:1:1					
PAINTER / TAPER	(BRUSH, NEW) *	01/01/202	0 \$32.93	\$8.20	\$18.20	\$0.00	\$59.33
* If 30% or more of surfaces to be painted are new construction,		construction, 07/01/202	0 \$34.03	\$8.20	\$18.20	\$0.00	\$60.43
ine w paint rate shar	i de useu. <i>PAINTERS LOCAL 35 - Z</i>	ONE 3 01/01/202	1 \$35.13	\$8.20	\$18.20	\$0.00	\$61.53

Effecti	ve Date - 01	/01/2020				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$16.47	\$8.20	\$0.00	\$0.00	\$24.67	
2	55		\$18.11	\$8.20	\$3.80	\$0.00	\$30.11	
3	60		\$19.76	\$8.20	\$4.14	\$0.00	\$32.10	
4	65		\$21.40	\$8.20	\$4.49	\$0.00	\$34.09	
5	70		\$23.05	\$8.20	\$16.13	\$0.00	\$47.38	
6	75		\$24.70	\$8.20	\$16.48	\$0.00	\$49.38	
7	80		\$26.34	\$8.20	\$16.82	\$0.00	\$51.36	
8	90		\$29.64	\$8.20	\$17.51	\$0.00	\$55.35	

Apprentice - PAINTER - Local 35 Zone 3 - BRUSH NEW

Effective Date -	07/01/2020

	Effecti	ve Date - 07/01/2020				Supplementa		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	To	otal Rate
	1	50	\$17.02	\$8.20	\$0.00	\$0.00		\$25.22
	2	55	\$18.72	\$8.20	\$3.80	\$0.00	1	\$30.72
	3	60	\$20.42	\$8.20	\$4.14	\$0.00	1	\$32.76
	4	65	\$22.12	\$8.20	\$4.49	\$0.00	1	\$34.81
	5	70	\$23.82	\$8.20	\$16.13	\$0.00	1	\$48.15
	6	75	\$25.52	\$8.20	\$16.48	\$0.00	I	\$50.20
	7	80	\$27.22	\$8.20	\$16.82	\$0.00	1	\$52.24
	8	90	\$30.63	\$8.20	\$17.51	\$0.00	I	\$56.34
-	Notes:							
		Steps are 750 hrs.						
L	Appre	ntice to Journeyworker Ratio:1:1						
PAINTER / TAP	ER (B	RUSH, REPAINT)	01/01/2020	\$30.25	\$8.20	\$18.20	\$0.00	\$56.65
PAINTERS LOCAL 3	5 - ZONI	33	07/01/2020	\$31.35	\$8.20	\$18.20	\$0.00	\$57.75
			01/01/2021	\$32.45	\$8.20	\$18.20	\$0.00	\$58.85
Effect	ive Date - 01/01/2020				Supplemental			
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Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate		
1	50	\$15.13	\$8.20	\$0.00	\$0.00	\$23.33		
2	55	\$16.64	\$8.20	\$3.80	\$0.00	\$28.64		
3	60	\$18.15	\$8.20	\$4.14	\$0.00	\$30.49		
4	65	\$19.66	\$8.20	\$4.49	\$0.00	\$32.35		
5	70	\$21.18	\$8.20	\$16.13	\$0.00	\$45.51		
6	75	\$22.69	\$8.20	\$16.48	\$0.00	\$47.37		
7	80	\$24.20	\$8.20	\$16.82	\$0.00	\$49.22		
8	90	\$27.23	\$8.20	\$17.51	\$0.00	\$52.94		

Apprentice -	PAINTER Local 35 Zone 3 - BRUSH REPAINT

Effective Date - 07/0

	Effecti	ve Date - 07/01/2	020				Supplemental			
	Step	percent	Apprentie	ce Base Wage	Health	Pension	Unemployment	Tot	al Rate	
	1	50		\$15.68	\$8.20	\$0.00	\$0.00		\$23.88	
	2	55		\$17.24	\$8.20	\$3.80	\$0.00		\$29.24	
	3	60		\$18.81	\$8.20	\$4.14	\$0.00		\$31.15	
	4	65		\$20.38	\$8.20	\$4.49	\$0.00		\$33.07	
	5	70		\$21.95	\$8.20	\$16.13	\$0.00		\$46.28	
	6	75		\$23.51	\$8.20	\$16.48	\$0.00		\$48.19	
	7	80		\$25.08	\$8.20	\$16.82	\$0.00		\$50.10	
	8	90		\$28.22	\$8.20	\$17.51	\$0.00		\$53.93	
	Notes:	·								
		Steps are 750 hrs.							Ì	
	Appre	ntice to Journeywo	ker Ratio:1:1							
PAINTER TRA	FFIC M	ARKINGS (HEAV	Y/HIGHWAY)	12/01/2019	\$31.50	\$8.10	\$12.72	\$0.00	\$52	2.32
LABORERS - ZONE 3 (HEAVY & HIGHWAY)				06/01/2020	\$32.31	\$8.10	\$12.72	\$0.00	\$53	3.13
				12/01/2020	\$33.12	\$8.10	\$12.72	\$0.00	\$53	3.94
				06/01/2021	\$33.96	\$8.10	\$12.72	\$0.00	\$54	4.78
				12/01/2021	\$34.79	\$8.10	\$12.72	\$0.00	\$55	5.61
For apprentice	rates see "	Apprentice- LABORER (Heavy and Highway)							
PANEL & PICK	COUNCI	UCKS DRIVER		12/01/2019	\$34.08	\$12.41	\$13.72	\$0.00	\$60	0.21
1 EmistEno vonvi	cooner			06/01/2020	\$34.98	\$12.41	\$13.72	\$0.00	\$61	1.11
				08/01/2020	\$34.98	\$12.91	\$13.72	\$0.00	\$61	1.61
				12/01/2020	\$34.98	\$12.91	\$14.82	\$0.00	\$62	2.71
				06/01/2021	\$35.78	\$12.91	\$14.82	\$0.00	\$63	3.51
				08/01/2021	\$35.78	\$13.41	\$14.82	\$0.00	\$64	4.01
				12/01/2021	\$35.78	\$13.41	\$16.01	\$0.00	\$65	5.20
PIER AND DOO DECK)	CK CON	ISTRUCTOR (UNE	DERPINNING AND	08/01/2019	\$43.79	\$9.90	\$21.15	\$0.00	\$74	4.84
PILE DRIVER LOC. For apprentice	AL 56 (ZO rates see "	NE 3) Apprentice- PILE DRIVE	R"							
PILE DRIVER	AI 56 (70	NE 2)		08/01/2019	\$43.79	\$9.90	\$21.15	\$0.00	\$74	4.84
TILE DRIVER LOC	AL 30 (20	ти <i>5)</i>								
Issue Date: 0	1/29/202	20	Wage Request Numbe	r: 2020012	29-024				Page	22 of 33

	Appre	ntice - PILE DRIVER -	Local 56 Zone 3							
	Effect	ive Date - 08/01/2019					Supplemental			
	Step	percent	Apprentice Base W	age	Health	Pension	Unemployment	Tot	tal Rate	
	1	0	\$0.00		\$0.00	\$0.00	\$0.00		\$0.00	
	Effective Date - 08/01/2019 Step percent Apprentic 1 0 Notes: Apprentice wages shall be no less than the follor (Same as set in Zone 1) 1 \$54.34/2\$58.99/3\$63.65/4\$65.98/5\$68.31/6\$6 Apprentice to Journeyworker Ratio:1:5 R 20NE 3 (BUILDING & SITE) ntice rates see "Apprentice- LABORER" R (HEAVY & HIGHWAY) 20NE 3 (HEAVY & HIGHWAY) 20NE 3 (HEAVY & HIGHWAY) PIPEFITTER PIPEFITTER PIPEFITTER PIPEFITTER LOCAL 104	be no less than the following Steps 55/4\$65.98/5\$68.31/6\$68.31/7\$72	; .96/8\$	72.96						
	Appre	ntice to Journeyworker	Ratio:1:5							
IPELAYER Aborers - zoni	E 3 (BUIL	DING & SITE)	12/02/	2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63	
For apprentice	e rates see	"Apprentice- LABORER"								
IPELAYER (I	HEAVY	& HIGHWAY)	12/01/	2019	\$31.75	\$8.10	\$12.72	\$0.00	\$52.57	
ABOKERS - ZONE 5 (HEAVI & HIGHWAI)		06/01/	2020	\$32.56	\$8.10	\$12.72	\$0.00	\$53.38		
			12/01/	2020	\$33.37	\$8.10	\$12.72	\$0.00	\$54.19	
			06/01/	2021	\$34.21	\$8.10	\$12.72	\$0.00	\$55.03	
			12/01/	2021	\$35.04	\$8.10	\$12.72	\$0.00	\$55.86	
For apprentice	e rates see	"Apprentice- LABORER (Heavy	and Highway)							
LUMBER & I	PIPEFIT PEFITTER	TER	09/17/	2019	\$41.21	\$8.75	\$16.35	\$0.00	\$66.31	
LOMDERS & I II	LIIIILA	LOCAL 104	03/17/	2020	\$42.21	\$8.75	\$16.35	\$0.00	\$67.31	
			09/17/	2020	\$43.21	\$8.75	\$16.35	\$0.00	\$68.31	
			03/17/	2021	\$44.21	\$8.75	\$16.35	\$0.00	\$69.31	
			09/17/	2021	\$45.21	\$8.75	\$16.35	\$0.00	\$70.31	
			03/17/	2022	\$46.46	\$8.75	\$16.35	\$0.00	\$71.56	
			09/17/	2022	\$47.46	\$8.75	\$16.35	\$0.00	\$72.56	
			03/17/	2023	\$48.71	\$8.75	\$16.35	\$0.00	\$73.81	
			09/17/	2023	\$49.71	\$8.75	\$16.35	\$0.00	\$74.81	
			03/17/	2024	\$50.96	\$8.75	\$16.35	\$0.00	\$76.06	

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Supplemental

Effect	Supplemental									
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate				
1	45	\$18.54	\$8.75	\$9.60	\$0.00	\$36.89				
2	50	\$20.61	\$8.75	\$9.60	\$0.00	\$38.96				
3	55	\$22.67	\$8.75	\$9.60	\$0.00	\$41.02				
4	60	\$24.73	\$8.75	\$9.60	\$0.00	\$43.08				
5	65	\$26.79	\$8.75	\$9.60	\$0.00	\$45.14				
6	70	\$28.85	\$8.75	\$9.60	\$0.00	\$47.20				
7	75	\$30.91	\$8.75	\$9.60	\$0.00	\$49.26				
8	80	\$32.97	\$8.75	\$9.60	\$0.00	\$51.32				
9	80	\$32.97	\$8.75	\$16.35	\$0.00	\$58.07				
10	80	\$32.97	\$8.75	\$16.35	\$0.00	\$58.07				

Apprentice - PLUMBER/PIPEFITTER - Local 104

Effect	ive Date -	03/17/2020
Step	percent	

Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	45	\$18.99	\$8.75	\$9.60	\$0.00	\$37.34
2	50	\$21.11	\$8.75	\$9.60	\$0.00	\$39.46
3	55	\$23.22	\$8.75	\$9.60	\$0.00	\$41.57
4	60	\$25.33	\$8.75	\$9.60	\$0.00	\$43.68
5	65	\$27.44	\$8.75	\$9.60	\$0.00	\$45.79
6	70	\$29.55	\$8.75	\$9.60	\$0.00	\$47.90
7	75	\$31.66	\$8.75	\$9.60	\$0.00	\$50.01
8	80	\$33.77	\$8.75	\$9.60	\$0.00	\$52.12
9	80	\$33.77	\$8.75	\$16.35	\$0.00	\$58.87
10	80	\$33.77	\$8.75	\$16.35	\$0.00	\$58.87
Notos	**1.1 2.5 2.0 4.12					

*1:1,2:5,3:9,4:12 Notes:

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.)	09/17/2019	\$41.21	\$8.75	\$16.35	\$0.00	\$66.31
PLUMBERS & PIPEFITTERS LOCAL 104	03/17/2020	\$42.21	\$8.75	\$16.35	\$0.00	\$67.31
	09/17/2020	\$43.21	\$8.75	\$16.35	\$0.00	\$68.31
	03/17/2021	\$44.21	\$8.75	\$16.35	\$0.00	\$69.31
	09/17/2021	\$45.21	\$8.75	\$16.35	\$0.00	\$70.31
	03/17/2022	\$46.46	\$8.75	\$16.35	\$0.00	\$71.56
	09/17/2022	\$47.46	\$8.75	\$16.35	\$0.00	\$72.56
	03/17/2023	\$48.71	\$8.75	\$16.35	\$0.00	\$73.81
	09/17/2023	\$49.71	\$8.75	\$16.35	\$0.00	\$74.81
	03/17/2024	\$50.96	\$8.75	\$16.35	\$0.00	\$76.06

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY &	12/01/2019	\$31.75	\$8.10	\$12.72	\$0.00	\$52.57
HIGHWAY) LABORERS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020	\$32.56	\$8.10	\$12.72	\$0.00	\$53.38
	12/01/2020	\$33.37	\$8.10	\$12.72	\$0.00	\$54.19
	06/01/2021	\$34.21	\$8.10	\$12.72	\$0.00	\$55.03
	12/01/2021	\$35.04	\$8.10	\$12.72	\$0.00	\$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWDERMAN & BLASTER LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$32.50	\$8.10	\$14.78	\$0.00	\$55.38
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY)	12/01/2019	\$32.50	\$8.10	\$12.72	\$0.00	\$53.32
LABORERS - ZONE 3 (HEAVY & HIGHWAY)	06/01/2020	\$33.31	\$8.10	\$12.72	\$0.00	\$54.13
	12/01/2020	\$34.12	\$8.10	\$12.72	\$0.00	\$54.94
	06/01/2021	\$34.96	\$8.10	\$12.72	\$0.00	\$55.78
	12/01/2021	\$35.79	\$8.10	\$12.72	\$0.00	\$56.61
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 98	12/01/2019	\$35.40	\$11.94	\$14.35	\$0.00	\$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 98	12/01/2019	\$34.87	\$11.94	\$14.35	\$0.00	\$61.16
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER	05/01/2019	\$21.74	\$10.87	\$6.50	\$0.00	\$39.11
TEAMSTERS 404 - Construction Service (Northampton)	05/01/2020	\$22.44	\$11.07	\$6.50	\$0.00	\$40.01
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63
For apprentice rates see "Apprentice- LABORER"						
ROLLER OPERATOR OPERATING ENGINEERS LOCAL 98	12/01/2019	\$34.26	\$11.94	\$14.35	\$0.00	\$60.55
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Coal tar pitch) ROOFERS LOCAL 248	07/16/2019	\$32.66	\$10.05	\$16.20	\$0.00	\$58.91
For apprentice rates see "Apprentice- ROOFER"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) ROOFERS LOCAL 248	07/16/2019	\$32.16	\$10.05	\$15.70	\$0.00	\$57.91

1	Appre	ntice - ROOFER	- Local 248						
]	Effecti	ive Date - 07/16	/2019		TT 1/1	D	Supplemental	Τ.(1.D. (
-	Step	percent	A	pprentice Base wage	Health	Pension	Unemployment	100	
	1	60		\$19.30	\$10.05	\$0.00	\$0.00		\$29.35
	2	65		\$20.90	\$10.05	\$15.70	\$0.00	5	\$46.65
	3	70		\$22.51	\$10.05	\$15.70	\$0.00	5	\$48.26
	4	75		\$24.12	\$10.05	\$15.70	\$0.00	5	\$49.87
	5	80		\$25.73	\$10.05	\$15.70	\$0.00	:	\$51.48
	6	85		\$27.34	\$10.05	\$15.70	\$0.00	;	\$53.09
	7	90		\$28.94	\$10.05	\$15.70	\$0.00	:	\$54.69
	8	95		\$30.55	\$10.05	\$15.70	\$0.00	5	\$56.30
	Notes:	Steps are 750 hrs	Roofer(Tear Off)1:1; S	ame as above					
	Appre	ntice to Journeyw	orker Ratio:1:3						
ROOFER SLATH ROOFERS LOCAL 24	E / TIL 48	E / PRECAST CO	NCRETE	07/16/2019	9 \$32.6	56 \$10.05	\$16.20	\$0.00	\$58.91
For apprentice ra	ates see '	'Apprentice- ROOFER"							
SCRAPER OPERATING ENGIN	EERS LO	OCAL 98		12/01/2019	9 \$34.8	37 \$11.94	\$14.35	\$0.00	\$61.16
For apprentice ra	ates see '	Apprentice- OPERATI	NG ENGINEERS"						
SELF-POWEREI (TAMPERS) OPERATING ENGINA For apprentice ra	D ROI EERS Lo ates see '	LLERS AND COM OCAL 98 'Apprentice- OPERATE	PACTORS	12/01/2019	9 \$34.2	26 \$11.94	\$14.35	\$0.00	\$60.55
SELF-PROPELL OPERATING ENGINA For apprentice ra	ED PC	OWER BROOM OCAL 98 'Apprentice- OPERATI	NG ENGINEERS"	12/01/2019	9 \$31.6	54 \$11.94	\$14.35	\$0.00	\$57.93
SHEETMETAL '	WORK	XER DCAL 63		01/01/2020	36.9	99 \$10.64	\$16.22	\$1.77	\$65.62

	Effecti	ve Date -	01/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rat	e
	1	45		\$16.65	\$6.21	\$4.67	\$0.00	\$27.5	3
	2	50		\$18.50	\$6.55	\$5.19	\$0.00	\$30.24	4
	3	55		\$20.34	\$6.88	\$9.33	\$1.08	\$37.6	3
	4	60		\$22.19	\$7.22	\$9.33	\$1.14	\$39.8	8
	5	65		\$24.04	\$7.55	\$9.33	\$1.20	\$42.12	2
	6	70		\$25.89	\$7.88	\$9.33	\$1.27	\$44.37	7
	7	75		\$27.74	\$8.22	\$9.33	\$1.33	\$46.6	2
	8	80		\$29.59	\$9.30	\$15.18	\$1.59	\$55.6	6
	9	85		\$31.44	\$9.64	\$15.18	\$1.66	\$57.9	2
	10	90		\$33.29	\$9.98	\$15.18	\$1.72	\$60.17	7
	Notes:								
	Appre	ntice to Jou	ırneyworker Ratio:1:3						
SPECIALIZED	EARTH	I MOVING	EQUIP < 35 TONS	12/01/2019	\$34.54	\$12.41	\$13.72	\$0.00	\$60.67
IEAMSIEKS JOINI	COUNC	IL NO. 10 ZOI	NE B	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
				08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
				12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
				06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
				08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
				12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
SPECIALIZED	EARTH	I MOVING	EQUIP > 35 TONS	12/01/2019	\$34.83	3 \$12.41	\$13.72	\$0.00	\$60.96
TEAMSTERS JOINT	COUNC	IL NO. 10 ZOI	NE B	06/01/2020	\$35.73	\$12.41	\$13.72	\$0.00	\$61.86
				08/01/2020	\$35.73	\$12.91	\$13.72	\$0.00	\$62.36
				12/01/2020	\$35.73	\$12.91	\$14.82	\$0.00	\$63.46
				06/01/2021	\$36.53	\$12.91	\$14.82	\$0.00	\$64.26
				08/01/2021	\$36.53	\$13.41	\$14.82	\$0.00	\$64.76
				12/01/2021	\$36.53	\$13.41	\$16.01	\$0.00	\$65.95
SPRINKLER FI	TTER rs local	L 669		01/01/2019	\$41.51	1 \$10.02	\$13.08	\$0.00	\$64.61

Apprentice -	SHEET METAL WORKER - Local 63

	Effectiv Step	ve Date - percent	01/01/2019	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
-	1	45		\$18.68	\$7.75	\$0.00	\$0.00	\$26.43	
	2	50		\$20.76	\$7.75	\$0.00	\$0.00	\$28.51	
	3	55		\$22.83	\$10.02	\$7.25	\$0.00	\$40.10	
	4	60		\$24.91	\$10.02	\$7.25	\$0.00	\$42.18	
	5	65		\$26.98	\$10.02	\$7.50	\$0.00	\$44.50	
	6	70		\$29.06	\$10.02	\$7.50	\$0.00	\$46.58	
	7	75		\$31.13	\$10.02	\$7.50	\$0.00	\$48.65	
	8	80		\$33.21	\$10.02	\$7.50	\$0.00	\$50.73	
	9	85		\$35.28	\$10.02	\$7.50	\$0.00	\$52.80	
	10	90		\$37.36	\$10.02	\$7.50	\$0.00	\$54.88	
-	Notes:								
L	Appren	tice to Jou	Irneyworker Ratio:1:1						
TELECOMMUN ELECTRICIANS LOC	NICATI CAL 7	ON TECH	NICIAN	12/29/2019	9 \$43	3.41 \$11.00	\$12.60	\$0.00	\$67.01

Apprentice - S	SPRINKLER FITTER - Local 669
Effective Date -	01/01/2019

App	rent	ice -	TELECOMMUNICATION TECHNICIAN - Local 7	
E. 66		D 4	12/20/2010	

Effective Date - 12/29/2019				Supplemental		
Step percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Ra	ate
1 40	\$17.36	\$6.00	\$0.52	\$0.00	\$23.	88
2 45	\$19.53	\$6.00	\$0.59	\$0.00	\$26.	12
3 50	\$21.71	\$11.00	\$6.95	\$0.00	\$39.	66
4 55	\$23.88	\$11.00	\$7.02	\$0.00	\$41.	90
5 65	\$28.22	\$11.00	\$8.15	\$0.00	\$47.	37
6 70	\$30.39	\$11.00	\$9.24	\$0.00	\$50.	63
Notes: Steps are 800 hours						
Apprentice to Journeyworker Ratio:1:1						_
TERRAZZO FINISHERS	08/01/2019	9 \$53.34	\$10.75	\$21.30	\$0.00	\$85.39
BRICKLAYERS LOCAL 3 (SPR/P111) - MARBLE & TILE	02/01/2020	0 \$53.34	\$10.75	\$21.94	\$0.00	\$86.03
	08/01/2020	0 \$54.69	\$10.75	\$22.09	\$0.00	\$87.53
	02/01/202	1 \$55.33	\$10.75	\$22.09	\$0.00	\$88.17
	08/01/202	1 \$56.73	\$10.75	\$22.25	\$0.00	\$89.73
	02/01/2022	2 \$57.32	2 \$10.75	\$22.25	\$0.00	\$90.32

	Effecti	ive Date -	08/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$26.67	\$10.75	\$21.30	\$0.00	\$58.72	
	2	60		\$32.00	\$10.75	\$21.30	\$0.00	\$64.05	
	3	70		\$37.34	\$10.75	\$21.30	\$0.00	\$69.39	
	4	80		\$42.67	\$10.75	\$21.30	\$0.00	\$74.72	
	5	90		\$48.01	\$10.75	\$21.30	\$0.00	\$80.06	
	Effecti	ive Date -	02/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$26.67	\$10.75	\$21.94	\$0.00	\$59.36	
	2	60		\$32.00	\$10.75	\$21.94	\$0.00	\$64.69	
	3	70		\$37.34	\$10.75	\$21.94	\$0.00	\$70.03	
	4	80		\$42.67	\$10.75	\$21.94	\$0.00	\$75.36	
	5	90		\$48.01	\$10.75	\$21.94	\$0.00	\$80.70	
	Notes:								
	Appre	entice to Jou	urneyworker Ratio:1:5						
TERRAZZO N	AECHAN	NIC	DDIE Ø THE	08/01/2019	\$54.4	2 \$10.75	\$21.30	\$0.00	\$86.47
DIACKLATEKS LU	ICAL 3 (SP	к/г111) - МА	ADLL & HLL	02/01/2020	\$54.4	2 \$10.75	\$21.93	\$0.00	\$87.10
				08/01/2020	\$55.7	7 \$10.75	\$22.08	\$0.00	\$88.60
				02/01/202	\$56.4	1 \$10.75	\$22.08	\$0.00	\$89.24
				08/01/2021	1 \$57.8	1 \$10.75	\$22.24	\$0.00	\$90.80

02/01/2022

\$58.38

\$22.24

\$10.75

\$0.00

\$91.37

Apprentice - TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Ptt) Effective Date -08/01/2019

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	Enecu	ve Date - 00/01/2017				Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50	\$27.21	\$10.75	\$21.30	\$0.00	\$59.26	
	2	60	\$32.65	\$10.75	\$21.30	\$0.00	\$64.70	
	3	70	\$38.09	\$10.75	\$21.30	\$0.00	\$70.14	
	4	80	\$43.54	\$10.75	\$21.30	\$0.00	\$75.59	
	5	90	\$48.98	\$10.75	\$21.30	\$0.00	\$81.03	
	Effectiv	ve Date - 02/01/2020				Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50	\$27.21	\$10.75	\$21.93	\$0.00	\$59.89	
	2	60	\$32.65	\$10.75	\$21.93	\$0.00	\$65.33	
	3	70	\$38.09	\$10.75	\$21.93	\$0.00	\$70.77	
	4	80	\$43.54	\$10.75	\$21.93	\$0.00	\$76.22	
	5	90	\$48.98	\$10.75	\$21.93	\$0.00	\$81.66	
	Notes:							
	Apprei	ntice to Journeyworker Ratio:1:5						
TEST BORING	DRILL	ER	12/01/2019	9 \$40.50) \$8.10	\$16.80	\$0.00	\$65.40
LABORERS - FOUN	NDATION .	AND MARINE	06/01/2020	0 \$41.49	9 \$8.10	\$16.80	\$0.00	\$66.39
			12/01/2020	0 \$42.47	7 \$8.10	\$16.80	\$0.00	\$67.37
			06/01/202	1 \$43.49	9 \$8.10	\$16.80	\$0.00	\$68.39
			12/01/202	1 \$44.50	\$8.10	\$16.80	\$0.00	\$69.40
For apprentice	rates see "	Apprentice- LABORER"						
TEST BORING	DRILL	ER HELPER	12/01/2019	9 \$39.22	2 \$8.10	\$16.80	\$0.00	\$64.12
LADOKEKS - FOON	DATION	AND MARINE	06/01/2020	9 \$40.2	\$8.10	\$16.80	\$0.00	\$65.11
			12/01/2020	9 \$41.19	9 \$8.10	\$16.80	\$0.00	\$66.09
			06/01/202	1 \$42.2	\$8.10	\$16.80	\$0.00	\$67.11
For apprentice	rates see ".	Apprentice- LABORER"	12/01/202	1 \$43.22	2 \$8.10	\$16.80	\$0.00	\$68.12
TEST BORING	LABOI	RER	12/01/2019	9 \$39.10) \$8.10	\$16.80	\$0.00	\$64.00
LABORERS - FOUN	NDATION .	AND MARINE	06/01/2020	0 \$40.09	9 \$8.10	\$16.80	\$0.00	\$64.99
			12/01/2020	0 \$41.0	7 \$8.10	\$16.80	\$0.00	\$65.97
			06/01/202	1 \$42.09	9 \$8.10	\$16.80	\$0.00	\$66.99
			12/01/202	1 \$43.10) \$8.10	\$16.80	\$0.00	\$68.00
For apprentice	rates see "	Apprentice- LABORER"						-
TRACTORS OPERATING ENGL	NEERS LC	DCAL 98	12/01/2019	9 \$34.20	5 \$11.94	\$14.35	\$0.00	\$60.55

Apprentice -	TERRAZZO MECH - Local 3 Marble/Tile (Spr/Pitt)
Effective Date	- 08/01/2019

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT	12/01/2019	\$35.12	\$12.41	\$13.72	\$0.00	\$61.25
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	06/01/2020	\$36.02	\$12.41	\$13.72	\$0.00	\$62.15
	08/01/2020	\$36.02	\$12.91	\$13.72	\$0.00	\$62.65
	12/01/2020	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	06/01/2021	\$36.82	\$12.91	\$14.82	\$0.00	\$64.55
	08/01/2021	\$36.82	\$13.41	\$14.82	\$0.00	\$65.05
	12/01/2021	\$36.82	\$13.41	\$16.01	\$0.00	\$66.24
TUNNEL WORK - COMPRESSED AIR	12/01/2019	\$51.38	\$8.10	\$17.20	\$0.00	\$76.68
LABORERS (COMPRESSED AIR)	06/01/2020	\$52.37	\$8.10	\$17.20	\$0.00	\$77.67
	12/01/2020	\$53.35	\$8.10	\$17.20	\$0.00	\$78.65
	06/01/2021	\$54.37	\$8.10	\$17.20	\$0.00	\$79.67
	12/01/2021	\$55.38	\$8.10	\$17.20	\$0.00	\$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	12/01/2019	\$53.38	\$8.10	\$17.20	\$0.00	\$78.68
LIDORERS (COMPRESSED ARY	06/01/2020	\$54.37	\$8.10	\$17.20	\$0.00	\$79.67
	12/01/2020	\$55.35	\$8.10	\$17.20	\$0.00	\$80.65
	06/01/2021	\$56.37	\$8.10	\$17.20	\$0.00	\$81.67
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$57.38	\$8.10	\$17.20	\$0.00	\$82.68
TUNNEL WORK - FREE AIR	12/01/2019	\$43.45	\$8.10	\$17.20	\$0.00	\$68.75
LABORERS (FREE AIR TUNNEL)	06/01/2020	\$44.44	\$8.10	\$17.20	\$0.00	\$69.74
	12/01/2020	\$45.42	\$8.10	\$17.20	\$0.00	\$70.72
	06/01/2021	\$46.44	\$8.10	\$17.20	\$0.00	\$71.74
	12/01/2021	\$47.45	\$8.10	\$17.20	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"		• • • •				•••••
TUNNEL WORK - FREE AIR (HAZ. WASTE)	12/01/2019	\$45.45	\$8.10	\$17.20	\$0.00	\$70.75
LABORERS (FREE AIR TUNNEL)	06/01/2020	\$46.44	\$8.10	\$17.20	\$0.00	\$71.74
	12/01/2020	\$47.42	\$8.10	\$17.20	\$0.00	\$72.72
	06/01/2021	\$48.44	\$8.10	\$17.20	\$0.00	\$73.74
	12/01/2021	\$49.45	\$8.10	\$17.20	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL TEAMSTERS JOINT COUNCIL NO 10 ZONE B	12/01/2019	\$34.54	\$12.41	\$13.72	\$0.00	\$60.67
	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
WAGON DRILL OPERATOR LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2019	\$31.75	\$8.10	\$14.78	\$0.00	\$54.63
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	12/01/2019	\$31.75	\$8.10	\$12.72	\$0.00	\$52.57
LABUKEKS - ZUNE 3 (HEAVY & HIGHWAY)	06/01/2020	\$32.56	\$8.10	\$12.72	\$0.00	\$53.38
	12/01/2020	\$33.37	\$8.10	\$12.72	\$0.00	\$54.19
	06/01/2021	\$34.21	\$8.10	\$12.72	\$0.00	\$55.03
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	\$35.04	\$8.10	\$12.72	\$0.00	\$55.86
Issue Date: 01/20/2020 Wago Doguoot Numbou	20200120	.024				Page 31 of 22
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WATER METER INSTALLER	09/17/2019	\$41.21	\$8.75	\$16.35	\$0.00	\$66.31
PLUMBERS & PIPEFIITERS LOCAL 104	03/17/2020	\$42.21	\$8.75	\$16.35	\$0.00	\$67.31
	09/17/2020	\$43.21	\$8.75	\$16.35	\$0.00	\$68.31
	03/17/2021	\$44.21	\$8.75	\$16.35	\$0.00	\$69.31
	09/17/2021	\$45.21	\$8.75	\$16.35	\$0.00	\$70.31
	03/17/2022	\$46.46	\$8.75	\$16.35	\$0.00	\$71.56
	09/17/2022	\$47.46	\$8.75	\$16.35	\$0.00	\$72.56
	03/17/2023	\$48.71	\$8.75	\$16.35	\$0.00	\$73.81
	09/17/2023	\$49.71	\$8.75	\$16.35	\$0.00	\$74.81
	03/17/2024	\$50.96	\$8.75	\$16.35	\$0.00	\$76.06
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFI	TTER"					
Outside Electrical - West						
EQUIPMENT OPERATOR	09/01/2019	\$44.67	\$8.00	\$12.55	\$0.00	\$65.22
OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42						
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN	09/01/2019	\$30.58	\$8.00	\$5.48	\$0.00	\$44.06
OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42						
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN / TRUCK DRIVER	09/01/2019	\$39.97	\$8.00	\$10.96	\$0.00	\$58.93
OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42						
For apprentice rates see "Apprentice- LINEMAN"						
HEAVY EQUIPMENT OPERATOR	09/01/2019	\$47.01	\$8.00	\$13.22	\$0.00	\$68.23
OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42						
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN	09/01/2019	\$51.71	\$8.00	\$15.55	\$0.00	\$75.26
OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42						

Apprentice - LINEMAN (Outside Electrical) - West Local 42

en nercent					Supprementar		
op percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	e
60		\$31.03	\$8.00	\$3.43	\$0.00	\$42.46	5
65		\$33.61	\$8.00	\$3.51	\$0.00	\$45.12	2
70		\$36.20	\$8.00	\$3.59	\$0.00	\$47.79)
75		\$38.78	\$8.00	\$5.16	\$0.00	\$51.94	ł
80		\$41.37	\$8.00	\$5.24	\$0.00	\$54.61	l
85		\$43.95	\$8.00	\$5.32	\$0.00	\$57.27	7
90		\$46.54	\$8.00	\$7.40	\$0.00	\$61.94	ł
otes:							
pprentice to J	ourneyworker Ratio:1:2						
LE SPLICER L Workers - We	ST LOCAL 42	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
EMAN/EQUIP L Workers - We	MENT OPERATOR IST LOCAL 42	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
EMAN/INSTA L WORKERS - WE	LLER/TECHNICIAN ST LOCAL 42	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
	60 65 70 75 80 85 90 	60 65 70 75 80 85 90 	60 \$31.03 65 \$33.61 70 \$36.20 75 \$38.78 80 \$41.37 85 \$43.95 90 \$46.54 oprentice to Journeyworker Ratio:1:2 Deprentice to Journeyworker Ratio:1:2 LE SPLICER 02/04/2019 WORKERS - WEST LOCAL 42 02/04/2019 MAN/EQUIPMENT OPERATOR 02/04/2019 WORKERS - WEST LOCAL 42 02/04/2019 EMAN/INSTALLER/TECHNICIAN 02/04/2019 WORKERS - WEST LOCAL 42 02/04/2019	60 \$31.03 \$8.00 65 \$33.61 \$8.00 70 \$36.20 \$8.00 75 \$38.78 \$8.00 80 \$41.37 \$8.00 80 \$43.95 \$8.00 90 \$46.54 \$8.00 90 \$46.54 \$8.00 90 \$46.54 \$8.00 91 \$46.54 \$8.00 92 \$46.54 \$8.00 93 \$46.54 \$8.00 94 \$46.54 \$8.00 95 \$28.93 \$26.93 96 \$28.93 \$28.93 97 \$28.93 \$28.93 98 \$28.93 \$28.93	60 \$31.03 \$8.00 \$3.43 65 \$33.61 \$8.00 \$3.51 70 \$36.20 \$8.00 \$3.59 75 \$38.78 \$8.00 \$5.16 80 \$41.37 \$8.00 \$5.24 85 \$43.95 \$8.00 \$5.32 90 \$46.54 \$8.00 \$7.40 intes:	60 \$31.03 \$8.00 \$3.43 \$0.00 65 \$33.61 \$8.00 \$3.51 \$0.00 70 \$36.20 \$8.00 \$3.59 \$0.00 75 \$38.78 \$8.00 \$5.16 \$0.00 80 \$41.37 \$8.00 \$5.24 \$0.00 85 \$43.95 \$8.00 \$5.32 \$0.00 90 \$46.54 \$8.00 \$7.40 \$0.00 https://workers.west.cocal.42 O2/04/2019 \$30.73 \$4.70 \$3.17 MAN/EQUIPMENT OPERATOR workers - West Local.42 02/04/2019 \$28.93 \$4.70 \$3.14 Workers - West Local.42 02/04/2019 \$28.93 \$4.70 \$3.14	60 \$31.03 \$8.00 \$3.43 \$0.00 \$42.46 65 \$33.61 \$8.00 \$3.51 \$0.00 \$45.12 70 \$36.20 \$8.00 \$3.59 \$0.00 \$47.75 75 \$38.78 \$8.00 \$5.16 \$0.00 \$51.94 80 \$41.37 \$8.00 \$5.24 \$0.00 \$54.61 85 \$43.95 \$8.00 \$5.32 \$0.00 \$57.27 90 \$46.54 \$8.00 \$7.40 \$0.00 \$61.94 https://worker.atio:1:2 LE SPLICER

Issue Date: 01/29/2020

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTOR-TRAILER DRIVER OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	09/01/2019	\$44.67	\$8.00	\$12.55	\$0.00	\$65.22
TREE TRIMMER OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	01/31/2016	\$18.51	\$3.55	\$0.00	\$0.00	\$22.06
This classification applies only to tree work done: (a) for a utility company, R.E.A. cooper operating, maintaining, or repairing the utility company's equipment, and (c) by a person This classification does not apply to wholesale tree removal.	erative, or railroad or who is using hand o	coal mining com r mechanical cutt	npany, and (b) ing methods a	for the purpos and is not on th	e of e ground.	
TREE TRIMMER GROUNDMAN OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	01/31/2016	\$16.32	\$3.55	\$0.00	\$0.00	\$19.87
This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperating, maintaining, or repairing the utility company's equipment, and (c) by a person classification does not apply to wholesale tree removal.	erative, or railroad or who is using hand o	coal mining com r mechanical cutt	pany, and (b) ing methods a	for the purpos and is on the gr	e of ound. This	

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

ATTACHMENT F

DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF WATER RESOURCES DIVISION OF MUNICIPAL SERVICES POLICIES

APPENDIX F

DEPARTMENT OF ENVIRONMENTAL PROTECTION <u>BUREAU OF WATER RESOURCES</u> <u>DIVISION OF MUNICIPAL SERVICES POLICIES</u>

The Division of Municipal Services (DMS) has established the following policies for all Division financially-assisted projects.

POLICY MEMORANDUM NO. PM-1 EASEMENTS AND RIGHTS OF WAY

Prior to the approval of financial assistance for construction, the owner shall obtain and shall thereafter retain, a fee simple or such estate or interest in the site of construction and rights of access as will assure undisturbed use and possession for the purpose of construction and operation for the estimated life of the project. The Division may refuse to approve financial assistance until it has received from the owner sufficient assurances that such interests have been obtained. Unless the Division otherwise notifies the owner, the certificate (under pains and penalties of perjury) of the owner's legal representative shall constitute such sufficient assurance.

Additional cost which result from interruptions of construction or extensions of contract time caused by the owner's failure to obtain the necessary interests in land shall be ineligible for financial assistance, and all such additional costs shall be borne by the owner.

POLICY MEMORANDUM NO. PM-2

PERMITS

The owner shall be responsible for identifying and obtaining all federal, state, local and railroad permits required by the nature and location of construction, including but not limited to building construction permits and permits for street and highway cuts and openings, and all such permits shall be listed in a separate permits section of the contract documents. To the extent possible, such permits shall be obtained by the owner prior to the solicitation of bids for construction, and copies of all permits so obtained shall be included in the said permits section. The status of the application for each permit, including the permit conditions, and costs, not obtained prior to the solicitation of bids shall also be indicated in the contract documents permits section. The Division may refuse to approve financial assistance for construction unless and until it has received from the owner sufficient assurances that all necessary permits have been or will be obtained prior to the commencement of construction.

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Policy Memorandum No. PM-2 - Permits (Con't)

The contractor shall be responsible for obtaining all permits required of his equipment, work force, or particular operations (such as blasting) in the performance of the contract and not otherwise specified in the two preceding paragraphs as to be obtained by the owner. These permit fees shall be paid by the contractor.

The owner shall be responsible for the payment of all other permit fees required by the construction.

The following permits shall not be eligible for financial participation by the Department of Environmental Protection (DEP).

- Permits and insurance for construction in railroads' rights of way;
- Building permits;
- Permits for opening public streets and other public or municipal rights of way;
- Permits for the use of explosives;
- Permits for the disposal of waste materials;
- Permits and fees for connecting to municipal utilities.

Permits required by extraordinary circumstances and not specifically excluded from eligibility above may be eligible for DEP participation. For such permits to be so eligible, the owner or his representative must notify the DEP project engineer in advance of obtaining such permit and receive from the engineer specific agreement that such permit will be eligible for DEP participation. Eligibility for such participation will not be made retroactively.

Additional costs which result from interruptions of construction or extensions of contract time resulting from the owner's or the contractor's failure to obtain the necessary permits may be ineligible for participation.

POLICY MEMORANDUM NO. PM-3

FIELD CONTROLS

The Owner shall be responsible for indicating on the contract drawings all easement limits and all property and other control lines for locating the principal component parts of the work together with those elevations and bench marks used in the design of the work, all hereinafter referred to as "field controls". Where easement and property limits have not previously been established in the field, the owner shall be responsible for establishment of such limits. From the information provided by the Owner, unless otherwise specified, the Contractor shall develop and make all layouts required for construction, such as slope stakes, batter boards, stakes for pipe locations and other working points, lines, elevations and cut sheets.

Whenever he has reason to believe that an error exists or whenever he is otherwise unable to locate the field controls, the contractor shall promptly notify the owner and the owner's engineer of such error with appropriate documentation.

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POLICY MEMORANDUM NO. PM-4

RECORD DRAWINGS

The Owner shall be responsible for the preparation of all record drawings required by this contract. This responsibility may be delegated to the Owner's representative. The responsibility for preparation of record drawings shall not be delegated or transferred to the contractor. They may use the contractor's and sub-contractor's certified AS BUILT drawings along with their own marked up set in the preparation of the Record Drawings.

Division approved contract drawings shall be revised upon completion of the contract to reflect any changes made and/or final quantities, as appropriate.

POLICY MEMORANDUM NO. PM-5

PLAN SCALE

Unless otherwise approved in advance by the Division, the horizontal scale for construction plans for non-structural facilities shall be $1^{"} = 40^{"}$. A larger horizontal scale shall be used where appropriate to show sufficient detail to construct the project. The vertical scale for construction plans for non-structural facilities shall be $1^{"} = 4^{"}$. Based on the best information available at the time of their preparation, the location of underground utilities and support structures for overhead utilities shall be shown on the plans.

Unless otherwise exempted in advance by the Division, construction plans shall be updated whenever the date of the advertisement for bids for the construction of such facilities is more than one year after the date of approval by the Division or EPA; and in the case of approval by both such agencies, the later approval date shall be used in determining the need for update.

The consulting engineer shall receive adequate compensation for updating plans and specifications, and such additional cost shall be eligible for assistance to the extent not otherwise prohibited by USEPA and Division regulations and program guidance.

All revision, or review without need for revision, shall be noted and dated on the plans prior to advertisement of the project for bid.

POLICY MEMORANDUM NO. PM-6

BORINGS LOGS

All soil borings shall be taken as close as practicable to the construction line, and the location of all such borings shall be clearly indicated on the contract drawings. The plan view shall show the location and boring number of each boring. The profile view shall show the location, elevation, and depth of each soil boring, the location of each change in soil stratum, the groundwater level, and the average of blow counts at each five foot interval. As a minimum, boring logs to be submitted with the plans and specifications shall show the name of the company taking the borings, the soil classification, the number of blows per foot of penetration, the groundwater elevation, and the date on which the borings were taken.

As part of the submission of plans and specification for approval, the owner's representative shall include written justification for the lesser frequency and depth of borings where their interval is more than approximately 300' or their depth is less than 50% below depth of pipe invert.

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POLICY MEMORANDUM NO. PM-7

BREAKDOWN OF BID ITEMS

The following items shall, where applicable, be listed separately in the bid documents.

- 1. Mobilization 4. Rock-Excavation
- Pavement
 Municipal

 temporary
 permanent

 Select and/or borrow material
 - b. State i. temporary ii. permanent 8. Dewatering
 - 9. Special Dewatering (coffer dam)

PAVEMENT

3. Concrete cradle or encasement (to be identified where applicable)

Mobilization costs are the costs of initiating the contract, exclusive of the cost of materials. Payment for mobilization shall be a lump sum at the price bid for this item in the proposal and shall be payable when the contractor is operational on the site. For purposes of this policy, "operational" shall mean the substantial commencement of work on site.

The lump sum price bid for mobilization shall not exceed five per centum (5%) of the total amount of the bid.

POLICY MEMORANDUM NO. PM-8

All roads and trenches therein shall be refilled and repaved in accordance with specifications provided by the owner in the contract documents. Please note that this policy <u>may</u> be excludable on federally assisted projects where bid alternative items may be required (i.e. trench width vs. full width pavement). You are advised to seek project specific clarification.

Loan eligibility shall be limited to the following:

A. Where the depth of the pipe invert is 0 to 8', the maximum pavement widths which shall be eligible for financial assistance are as follows:

Nominal Pipe Diameter	Maximum Eligible Widths	
	Initial Pavement	Permanent Trench
0-24"	6'-6''	8'-6"

Where the nominal pipe diameter is greater than 24" the maximum eligible width for initial re-paving shall be the nominal diameter of the pipe plus four (4) feet, and for permanent trench repaying the maximum eligible width shall be the nominal pipe diameter plus six (6) feet.

B. For each additional four (4) feet (or fraction thereof) of pipe invert depth, add three feet to the eligible width limits stated in paragraph A.

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Policy Memorandum No. PM-8 - Pavement (Con't)

At the design phase of a project the owner has the option to elect either Initial Pavement with Option I (Permanent Trench replacement) or Initial with Option II (curb to curb over initial)

Initial Pavement



d*= depth of existing pavement to a maximum of 3 inches (see general notes #3) w = maximum eligible Initial pavement width as described in paragraphs "A" & "B" on

OPTION I Permanent Trench Pavement



d*= depth of existing pavement trench to a maximum of 3 inches (see general notes #3)

w = maximum eligible <u>permanent pavement width</u> as described in paragraphs "A" & "B". equals initial width plus 2 feet and includes:

- Cutting edges for the permanent trench
- Removal of initial patch plus two feet of existing pavement
- Fine grading/compacting gravel
- Placement of Permanent Trench pavement in two courses.

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page DEP-DMS-CG's-P4.

Policy Memorandum No. PM-8 – Pavement (Con't)



OPTION II <u>Curb to Curb Pavement (overlay pavement for roadways up to 28 feet)</u>

E.R.= edge of existing paved roadway t = one and one half inch $(1\frac{1}{2})$ overlay of bituminous concrete pavement

GENERAL NOTES:

- 1. Repavement of settled areas and crown restoration within the trench limits shall be the responsibility of the contractor.
- 2. Leveling outside the trench limits shall be the responsibility of the owner.
- 3. Sewer trench re-fill and pavement re-paving on public ways under the jurisdiction of the Massachusetts Department of Public Works, the Metropolitan District Commission, or other such agency shall be in accordance with permit(s) issued therefore by that Department or Commission, as the case may be.
- 4. The Division will consider requests for increase in the participating pay limits defined in paragraphs A and B, when such increases are, in the Division's opinion, reasonable. Such requests should be documented in writing and submitted to the Division in a timely manner.
- 5. Projects which deviate from the above options are required to seek Division review and approval.

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POLICY MEMORANDUM NO. PM-9

PIPE TESTING

Monthly payment estimates shall be prepared in accordance with contract documents. All pipe shall be tested in accordance with the contract documents and sound engineering practice. If, after 60 days following submission of a monthly payment estimate for pipe items, the pipe for which payment is requested has not been successfully tested, the owner may withhold up to 10% of the amount requested for such pipe items until the pipe has been so tested. However, in the case of a major (pipe diameter 24 inches or greater) interceptor pipe installation, sums retained by the owner pursuant to this policy memorandum shall not exceed two per centum (2%) of the costs of such pipe items.

POLICY MEMORANDUM NO. PM-10

CHANGE ORDERS

Executed change orders submitted to the Division for review and processing for financial assistance must be prepared on the attached Change Order Forms (PM-10, Attachment 1, pages A-1 & A-2) with a duplicate copy, calculation sheet(s) (PM-10, Attachment 2), and all other supporting documentation necessary for evaluation. Failure to comply with these instructions will result in delays in processing the change order and/or limited financial assistance.

M.G.L. c.44, s.31C requires that the auditor, accountant, or other municipal officer having similar duties must certify that adequate funding in an amount sufficient to cover the total cost of the change order has been made. Change orders will not be processed or approved until this certification is made on the face of the Change Order Form (PM-10 Attachment 1).

Payment of Change Orders:

Payment of all change orders shall be in accordance with the relevant provisions of Massachusetts General laws, Chapter 30, Section 39G for <u>non-building construction</u> and Section 39K for <u>building construction</u>.

Payment of change orders shall be made in accordance with one of the following three methods:

- A. Existing unit prices as set forth in the contract; or
- B. Agreed upon lump sum or unit prices; or
- C. Time and materials

A. <u>Payment for work for which there is a unit price in the contract:</u>

Where the contract contains a unit price for work and the Engineer orders a change for work of the same kind as other work contained in the contract and is performed under similar physical conditions, the contractor may accept full and final payment at the contract unit price(s) for the acceptable quantities.

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Policy Memorandum No. PM-10 – Change Orders (Con't)

B. <u>Payment for work or materials for which no price is contained in the contract:</u>

If the Engineer directs, the contractor shall submit promptly in writing to the Engineer and offer to do the required work on a lump sum or unit price basis, as specified by the Engineer. The stated price, either lump sum or unit price, shall be divided so as to show that it is the sum of:

- (1) The estimated cost of labor, plus
- (2) Direct Labor Cost, plus
- (3) Material and Freight Costs, plus
- (4) Equipment Costs, plus
- (5) An amount not to exceed 20% of the sum of items (1) through (4) for overhead and profit, plus (if applicable),
- (6) In the case of work done by a subcontractor an amount not to exceed 7 ½ %, for the general contractor of the sum of items (1) through (4) for his overhead and profit, less, if applicable,
- (7) Credits for work deleted from the contract.
- C. <u>Payment for work on a time and materials basis:</u>

Unless an agreed lump sum and/or unit price is obtained from above and is so stated in the change price, the contractor shall accept as full payment for which no other agreement is contained in contract, and amount equal to:

- (1) The estimated cost of Labor, plus
- (2) Direct Labor Cost, plus
- (3) Material and Freight Costs, plus
- (4) Equipment Costs, plus
- (5) An amount not to exceed 20% of the sum of items (1) through (4) for overhead and profit, plus (if applicable),
- (6) In the case of work done by a subcontractor an amount not to exceed 7 $\frac{1}{2}$ %, for the general contractor of the sum of items (1) through (4) for his overhead and profit, less, if applicable,
- (7) Credits for work deleted from the contract.

Explanation of items (1) through (7) as outlined in "B" and "C":

(1) <u>Labor</u> – Only those workers employed on the project who are doing the extra work, including the foreman in charge, are allowable. General foremen, superintendents, or other supervisory personnel are considered to be included in the overhead markup as provided in items (5) and/or (6). Hourly labor rates in excess of those as listed in the contract wage rates (Federal or State, whichever applies) require documentation. As a minimum, an explanation and the appropriate copy of the certified payroll are required.

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Policy Memorandum No. PM-10 - Change Orders (Con't)

- (2) <u>Direct Labor Costs</u> These costs are limited to those which are required in the contract document. Coverage in excess of the contract provisions, secured by the contractor/subcontractor(s) at his option, are ineligible for financial assistance. The following list of typical direct labor charges is provided for your assistance and is in no way intended to be complete or all encompassing:
 - Workman's Compensation
 - Federal/State: Social Security Tax and Unemployment Tax;
 - Health, Welfare and Pension Benefits; (this cost is included in the wage rates appearing in the Mass. Wage Rates of the contract specifications)

Liability Insurance:	Bodily Injury;
	Excess Umbrella;
	Property damage;
	Public Liability

•	Blasters Insurance)	
•	Puildors Dick Insurance)	
•	Builders Risk Insulance)	If applied to any required
•	Experience Modification Insurance)	direct labor costs.
	•)	
•	Surcharges)	

Following the Notice of Intent to Award, the Owner shall require the Low Bidder to submit the percentage to be used for the Direct Labor Cost markup, along with the breakdown of how it is calculated (this number shall be required and submitted to MassDEP before and Authorization to Award is issued by DMS). This documented direct labor cost may be adjusted upon the submission of new documentation which demonstrates both how and why it has changed.

(3) <u>Material and Freight</u> – Only those materials required as a result of the change order and reasonable freight charges for delivery of same are allowable.

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Policy Memorandum No. PM-10 - Change Orders (Con't)

- (4) <u>Equipment</u> Only the equipment required as a result of the change order is allowable. Equipment rental rates shall be governed by the current Nielson/Dataquest <u>Rental Rate bluebook</u> <u>for Construction Equipment</u> (the "Bluebook"). In determining the rental rate the following shall apply:
 - (a) For equipment already on the project the monthly prorated rental rate by the hourly use shall be applicable;
 - (b) For equipment not on the project the daily rate, the weekly rate, or monthly rate will prevail, whichever will prove to be most cost effective. Small tools and manual equipment are examples of costs not allowable under this item. These costs are considered to be included in the overhead markup as provided in items (5) and/or (6) (1 month (normal use) = 176 hours)
- (5) & (6) <u>Overhead and Profit</u> All other costs not previously mentioned are considered to be included in this item, be it for the general contractor or subcontractor(s).
- (7) <u>Credits</u> Work deleted, material and equipment removed from the contractor, stored and/or returned shall be credited to the cost of the change order, less costs.

The Contractor shall furnish itemized statements of the cost of the work ordered and shall give the Engineer access to all accounts, bills and vouchers relating thereto; and unless the Contractor shall furnish such itemized statements, and access to all accounts, bills and vouchers, he shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer. Deviations from any of the above will be reviewed for financial assistance on a case-by-case basis.

The change order will be prepared in such manner as to clearly separate Eligible and Ineligible Costs.

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CHANGE ORDER FORM

PM-10 Attachment 1

Page	1	of 2
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	Public Er	ntity	
	Contract Num	ıber	
	Change Order Num	ıber	
Contract Amount (As Bid)		\$	
Net Change in Contract Price (this cha	ange order)	\$	
Total Adjusted Contract Price (includi	ng this and all other change o	rders) <u></u> \$	
This change order extends the time to	complete the work by	calendar d	ays.
The extended completion date is			
This change order checked by			
	(Chief) Resident Engineer		Date
This change order is requested by:			
This change order is recommended by			
This change order is recommended by	·:		
This change order is recommended by Consultant Engineer	P.E. Number		Date
This change order is recommended by Consultant Engineer	P.E. Number		Date
This change order is recommended by Consultant Engineer The undersigned agree to the terms o	r: P.E. Number f the change order.		Date
This change order is recommended by Consultant Engineer The undersigned agree to the terms o Contractor	r:P.E. Number f the change order.	Date	Date
This change order is recommended by Consultant Engineer The undersigned agree to the terms o Contractor	r:P.E. Number f the change order.	Date	Date
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Public Entity	CHANGE ORDER F PM-10 Attachment 1	FORM (Continued) Page 2 of 2	
Public Entity			
SRF No: Contract No. Contract Title:	Public Entity		
Contract Title: Owner's Name: Owner's Address: Contractor's Address: Contractor's Address: Description of Change Reason for Change Reason for Change DEEP-DMS-PM Page 12 of 21 DEP-DMS-F Page 12 of 24	SRF No:	Contract No	Change Order No.
Owner's Name:	Contract Title:		
Owner's Address:	Owner's Name:		
Contractor's Name:	Owner's Address:		
Contractor's Address:	Contractor's Name:		
Description of Change	Contractor's Address:		
Image: Image: Image: Image: <td< td=""><td>Description of Change</td><td></td><td></td></td<>	Description of Change		
Reason for Change			
DEP-DMS-PM Page 12 of 21 DEP-DMS-F Page 12 of 24	Reason for Change		
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PM-10 Attachn	ment 2	
	CALCULATION SHEET	
(1) Labo	Dr	
	Foreman10 hrs @ \$10.00/hr.\$ 100.00Engineer10 hrs @ 8.50/hr85.00Operator10 hrs @ 9.50/hr95.00Laborers24 hrs @ 7.00/hr168.00	\$448.00
(2) Direc	ct Labor Cost (use the agreed upon Direct Labor Cost)	
* *	(30)% of \$448 (Used for example purposes only)	134.00
(3) Mate	erials & Freight 150 l.f. of 12" pipe @ \$2.00/l.f. 15 v.f. precast SMH Freight (slip #Enclosed) 25.00	2,025.00
(4) Equi	pment	
	1 Backhoe 10 hrs @ \$80.00/hr \$ 800.00 1 Truck-crane 10 hrs @ \$100.00/hr 1,000.00 Total (Items 1 through 4)	<u>1,800.00</u> 4,407.00
(5) 20%	markup for Overhead, Profit	
20%	of \$4,407	881.00
(6) $7\frac{1}{2}$	% markup for general contractor (if subcontractor is involved)	
7 1/20/	⁄o of \$4,407	331.00
(7) Cred	lits (deductibles)	- 323.00
	Total Cost	\$ 5,296.00
Reminder:	Provide support documentation as necessary i.e. vouchers, corres Calculation, photographs, reports	spondence, DEP-DMS-PM Page 13 of 21 DEP-DMS-F Page 13 of 24

POLICY MEMORANDUM NO. PM-11

UTILITY RELOCATION

The construction of treatment facilities, sewers, pumping stations, force mains and appurtenant work can cause the relocation of utilities. Costly relocation can sometimes be minimized by early communication and cooperation of the representatives of the municipality (owner) and the utilities.

Every possible effort should be made by the owner and each utility to establish the location of existing utilities in the vicinity of the proposed construction. The owner or its consulting engineer should make every reasonable effort to design the proposed construction so that relocation of existing utilities is minimized whenever possible. If the proposed construction is in an area of many existing utilities or in an otherwise critical area, the utilities are encouraged to mark the location of their existing utilities at the site during the design phase of the project.

During the design phase of the project, the municipality should provide timely notice to all utilities known or thought to have facilities in or proximate to the site of such future construction.

POLICY MEMORANDUM NO. PM-12

<u>REFUNDABLE DEPOSITS FOR</u> <u>PLANS AND SPECIFICATIONS</u>

For each set of project plans and specifications provided, the owner may require a deposit in form of cash or other appropriate security, in an amount sufficient to cover the costs of production of such plans and specifications.

Upon return of the plans and specifications to the owner within a reasonable time and in good condition, such deposit shall be refunded.

Actual mailing costs, if any, shall be borne by the party requesting such plans and specifications.

POLICY MEMORANDUM NO. PM-13

BID OPENING PROCEDURES

As a minimum, bid documents shall be reviewed/inspected for conformance to the following bid opening procedure in the order presented below. Failure to comply with any of these steps shall render the bid non-responsive and upon determination of such non-responsiveness, such bid shall be rejected immediately, set aside, and shall receive no further consideration.

Bid Opening Procedure

Step #1. <u>Timeliness</u> – The bid must be filed at the place and within the time specified therefore in the invitation to bid, and no bid shall be accepted after such time. The time at which a bid is filed should be time/date stamped or otherwise prominently noted on the bid;

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Policy Memorandum No. PM-13 - Bid Opening Procedures (Con't)

- Step #2. <u>Bid Security</u> Properly executed bid security, in the amount and terms specified in the invitation to bid (equal to 5% of Base Bid or Highest Possible Amount considering all alternatives) shall be placed in a seal envelope and attached to the outside of the envelope containing the bid at the time of its submission;
 - A. Bid Bond

The Bid bond must be <u>dated On or Before the Bid Date</u>; Issued by a <u>Bonding Company Licensed in Massachusetts</u>; <u>Accompanied by a Current Power of Attorney</u>; <u>Signed by Surety</u>;

B. Check

The Check must be a Certified, Cashiers or Bank Treasurer's; Dated On or Before the Bid Date;

- Step #3. <u>Bid Signature</u> The bid and all accompanying documents so required shall be signed by the bidder or its authorized representative before submission;
- Step #4. <u>Addenda</u> All addenda shall be sent certified mail, return receipt requested, by the owner to all individuals and organizations which have received plans and specifications and shall be mailed not later than five days prior to the date established for submission of bids. All bidders shall include with their bids written acknowledgement of receipt of all addenda, which acknowledgement may be on a form provided therefore by the owner.

Alternates – Any Alternates shall be acknowledged.

Step #5. Written Dollar Amounts – The total dollar amount of each bid shall be read, and the three lowest bids shall be selected for further consideration. The remaining bids shall then be set aside. The three apparent low bids shall be read to determine whether the unit price for each line item of each bid has been written therein in words. If it has not, such bid shall be rejected and shall receive no further consideration. Bid amounts shall be consistent (words vs. numbers) and if words and numbers differ, the words govern. This procedure shall then be repeated with the next apparent low bid until three are acceptable which have all the unit prices written in words, at which time the lowest bid shall be announced as the apparent low bidder, and the bid opening procedure shall be closed.

The Division recommends that this policy memorandum be included in all contract specifications and that the owner's evaluator(s) use the attached form (PM-13 Attachment 1) for bid opening procedures.

The Contractor's Bid Opening Checklist also attached hereto, is for use by each contractor to assure that his bid conforms with this policy memorandum. It is recommended that the checklist (PM-13 Attachment 2) be included in information for bidders, or at the end of the bid proposal, or in some other prominent part of the bid specifications

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PM-13 Attachment 1

FORM FOR BID OPENING PROCEDURES

(to be completed by the owner's evaluator(s))

CONTRACT NO .:

DATE:

CONTRACT NAME:

BID OPENING TIME:

All non-responsive bids shall be rejected forthwith by the awarding authority upon determination of such bids' non-responsiveness at the time bids are opened and read. Failure to comply with any one of the requirements shall render the bid non-responsive, and upon determination of such non-responsiveness such bid shall be rejected and receive no further consideration.

		A = Acceptable		N-R = Non-R	esponsive (explain reas	ons on supplement	ntal sheet	& attach)
	BIDDER	1. TIMELINESS	2. BID SECURITY	3. SIGNATURE	4. ADDENDA ALTERNATIVES	WRITTEN 5. DOLLAR AMOUNTS	COMPL (CIRCL	.IANCE E ONE)
1							YES	NO
2							YES	NO
3							YES	NO
4							YES	NO
5							YES	NO
6							YES	NO
7							YES	NO
8							YES	NO
9							YES	NO
10							YES	NO
11							YES	NO
12							YES	NO
					Evaluator(s)			

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PM-13 Attachment 2

BID OPENING PROCEDURES CONTRACTORS CHECKLIST

All non-responsive bids shall be rejected forthwith by the awarding authority upon determination of such bids' non-responsiveness at the time bids are opened and read. Failure to comply with one or more of the following requirements shall render the bid non-responsive, and upon determination of such non-responsiveness such bid shall be rejected and receive no further consideration.

ITEM	REQUIREMENTS	COMPLIANCE (CIRCLE 1)		REASONS FOR REJECTION
1. Timeliness	Bid filed w/in time specified	Yes	No; Rejected	
2. Bid Security	Appropriate and properly Executed security w/bid.	Yes	No; Rejected	
3. Signature	Bid signed by authorized Representative	Yes	No; Rejected	
4. Addenda	All addenda acknowledge Any alternative	Yes	No; Rejected	
5. Dollar Amount	Dollar amount in words Specified for each line item in bid	Yes	No; Rejected	

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POLICY MEMORANDUM NO. PM-14 PAYMENT FOR ROCK EXCAVATION

There shall be in the contract documents a separate pay item for rock excavation. For such purposes, "rock" shall mean igneous, sedimentary, metamorphic, and conglomerate rock, which for excavation must be drilled, blasted, broken, or ripped by power tools. Boulders and concrete structures one cubic yard or greater, however removed, are included within this definition of rock for payment purposes. At the option of the owner or his representative a separate pay item for boulders, concrete structures, or concrete road base may be used.

Depth From Ground Surface	<u>Pay W</u>	/idth
To Invert Pipe	(Nominal Pip	e Diameter)
* 0-12'	<u>0-24"</u>	<u>Over 24"</u>
* Over 12' – 20'	5'0"	D+3'0"
	7'0"	D+5'

Engineer's plans and specifications shall establish pay limits below pipe and structures.

• See PM-14 Attachment 1 (typical cross section)

Payment width for depths over twenty feet (20') shall be determined on a case-by-case basis consistent with the foregoing chart.

The pay limit for rock removal outside proposed manholes shall commence one foot (1') outside the widest dimension of the structure of shall be the maximum connecting trench width, whichever is greater.

Payment depth for rock which is encountered in a trench shall be no less than three feet (3') when removal can be accomplished only by drilling and blasting or by use of jack (air or hydraulic) hammers.

Payment for rock removed, using the same or equal equipment as utilized for normal trench excavation, shall be limited to the actual depth removed within the limits established by the contract documents.

Boulders encountered within the pay limits of excavation, whose volume is one cubic yard or greater, part of which extends outside said limits shall be paid in accordance with the actual volume excavated.

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POLICY MEMORANDUM NO. PM-15

TRAFFIC POLICE

The reasonable costs for police details required for traffic control on a construction project which receives financial assistance shall be considered as an eligible administrative cost. A police detail item <u>shall not</u> be included as a bid item in the contract documents.

"Police" as used in this memorandum includes local, county, capital, state, regular and auxiliary police.

Owner's Responsibility

It shall be the owner's responsibility to submit in writing the hourly rate of pay to be established for detailed traffic police and each change in rate during the course of the project. It is the owner's responsibility to arrange, document and pay for such police details. The owner or its representative shall meet with the police chief or other officer in charge of police detail duty to review contract needs. The owner shall maintain a daily record of the following:

- a. Officer's name
- b. Hours worked
- c. Location of assignment
- d. Hourly rate

POLICY MEMORANDUM NO. PM-16 DOCUMENTATION REQUIRED TO SUBSTANTIATE CONTRACT QUANITITES

<u>Unit</u>	Documentation required
Acres (A)	Location, station, offset and calculations. Location = Street right-of-way, etc; Station = Point on Baseline; Offset = Distance left or right of Baseline
Cubic Yard (C.Y.)	Location, stations, widths, depths, calculations and Cross sections as necessary
Each (Ea.)	Location, station, and offset.
Gallon (Gal.)	Location, stations, calculations (if appropriate) and delivery slips.
Hour (Hr.)	Hours and location.
Linear Feet (L.F.)	Location, stations, and offsets.
Month (Mo.)	Location, period of time and calculations if applicable.

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1000 Foot Board Measure (MFBM)	Location, stations, offset, elevations, grade, and calculations.
	Attach invoices where applicable.
Pound (Lb.)	Locations, stations, and calculations (if applicable). Attach Delivery weight slips.
Square Feet (S.F.)	Locations, stations and calculations
Square Yard (S.Y.)	Locations, stations and calculations
Ton	Locations, stations and calculations (if applicable). Attach Delivery weight slips.
Vertical Feet (V.F.)	Locations, stations, elevations, and offsets.

Note:

- 1. All of the above, that apply must be submitted with a final payment request or change order as applicable.
- Where in place measurement is not possible or practical, delivery slips may be used to substantiate quantities.
 Change orders See PM-10 in which some of the above may be applicable in justifying materials, equipment and labor.
- 4. When necessary, itemized quantities must be separated into eligible and non-eligible units with separate calculations to justify eligible costs.
- 5. Overruns and underruns of any specific item shall be explained with an appropriate sentence or paragraph.
- 6. On all quantities, units of payment shall be maintained at the project site and shall be updated daily so that upon field inspection by the C.O.E., EPA or DMS, the quantities paid to date can be substantiated.
- 7. In the case of unforeseen conditions, photos should be submitted with the applicable item in addition to the recommended documentation.
- 8. Documentation of units of payment shall be clearly legible and cross referenced to the applicable sheets of the record drawings.
- 9. For record drawings policy, please see PM-4.

DMS Policies 1 through 16 Approved By:

Steven J. McCurdy Division of Municipal Services

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DWS POLICY 88-02 DEPARTMENT OF ENVIRONMENTAL PROTECTION POLICY FOR REVIEW OF SEWER LINE/WATER SUPPLY PROTECTION

The Department of Environmental Protection seeks to protect existing and potential water supplies from the potentially negative effects of leaking sewer lines through the adoption of a Department policy on this subject.

The following restrictions will apply to new sewer construction statewide:

Gravel Packed Wells

~ Within the 400 foot radius protective distance around gravel packed wells, all sewer lines and appurtenances are prohibited, unless they are necessary to eliminate existing and/or potential sources of pollution to the well.

Tubular Wells

 Within the 250 foot radius protective distance around tubular wells, all sewer lines and appurtenances are prohibited, unless they are necessary to eliminate existing and/or potential sources of pollution to the well.

Gravel Packed and Tubular Wells

- Within a minimum radius of 2,640 feet or unless otherwise documented by an appropriate study specifically defining the area of influence and approved by the Division of Water Supply, all sewer lines and appurtenances will be designed and constructed for maximum water tightness.
- <u>Force Mains or Pressure Sewers:</u> shall be tested at 150% above maximum operating pressure or 150 p.s.i. whichever is greater. Testing shall conform to the requirements of the American Water works Association (AWWA) standard c 600.
- <u>Gravity Sewers:</u> shall be tested by approved methods which will achieve test results for infiltration or exfiltration of less than 100 gallons/inch diameter/mile/24 hours.
- <u>Manholes:</u> shall be installed with watertight covers with locking or bolted and gasketed assembles. Testing for infiltration/exfiltration shall conform to the same standards as the maximum allowed for pipes in the manhole as required for gravity sewers, indicated above.
- Satisfactory test results for Force Mains, Manholes and Gravity Sewers shall be performed prior to the expiration of the contractor's one year guarantee period.
- All pumping stations within this zone shall have standby power high water alarms telemetered to an appropriated location that is manned at all times. An emergency contingency plan must be developed by the owner and approved by the BWR.
- A minimum of Class B bedding as defined by WPCF-MOP9 must be used for all piping.
- Service connections (laterals and house connections) shall be rigidly inspected by the appropriate municipal official. Certified inspection reports shall be submitted to the BWR.

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Bedrock Wells

The above requirements are the same for bedrock wells, with the Department reserving the right to require more stringent controls on a case-by-case basis.

Surface Water Supplies

- Within 100 feet of all surface water supplies and tributaries all sewer lines and appurtenances are prohibited except as required to cross tributaries or to eliminate existing or potential pollution to the water supply. In the latter case, watertight construction methods shall be use.
- Tributary stream crossings shall employ watertight construction methods of sewer lines and manholes.
 Watertight construction must extend 100 feet to either side of the stream.
- Within 1,000 feet of surface water supplies and tributaries, all pumping stations shall have standby power and high water alarms telemetered to an appropriate location that is manned at all times. An emergency contingency plan must be developed by the owner of the wastewater treatment facility and submitted to the BWR for approval.
- ~ Beyond 1,000 feet and within the watershed of surface water supplies the Department may in specific circumstances after review, require additional controls.

Potential Public Water Supplies

The above requirements also apply to potential public water supplies.

Baseline Date Requirements

Two (2) copies of an appropriately scaled map(s) shall be submitted to the Department which details the proposed sewers and/or appurtenances and also includes the following:

- (1) the location of all nearby existing or potential surface water supplies, tributaries thereto, and watershed boundaries;
- (2) the location of existing and potential public and municipal potable groundwater supply wells.

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The Department reserves the right to impose more restrictive measures than those contained in this policy as deemed appropriate.

Definitions

- Appurtenances all attachments to sewer lines necessary for the transport and operation and maintenance of sewer lines, including manholes, pumping station, siphons, etc.
- Area of influence that area of an aquifer which contributes water to a well under the most severe recharge and pumping condition that can be realistically anticipated (i.e. pumping at the safe yield of the well for 180 days without any natural recharge occurring). It is bounded by the groundwater divides which result from pumping the well and by the contact of the edge of the aquifer with less permeable materials such as till and bedrock. At some locations, streams and lakes may form recharge boundaries.
- Potential public water supply areas designated by communities for water supply purposes where land has been set aside and Department approved pump tests conducted and surface water supplies as defined below.
- Surface Water Supply Waters classified as Class A by the DWPC.
- Public Water Supply Systems as defined in 310 CMR 22.02 (DEP Drinking Water Regulations).
- Class B Bedding as defined in WPCF Manual of Practice No. 9.



APPROVED: (Signature on File)

Class B---First-Class Bedding – Class B bedding may be achieved by either of two construction methods:

- a. Shaped Bottom with Tamped Backfill. The bottom of the trench excavation shall be shaped to conform to a cylindrical surface with a radius at least 2 in. (5 cm) greater than the radius to the outside of the pipe and with a width sufficient to allow six-tenths of the width of the pipe barrel to be bedded in fine granular fill placed in the shaped excavation. Carefully compacted backfill shall be placed at the sides of the pipe to a thickness of at least 12 in. (30 cm) above the top of the pipe. Shaped trench bottoms are difficult to achieve under current construction conditions.
- b. Compacted Granular Bedding with Tamped Backfill. The pipe shall be bedded in compacted granular material placed on a flat trench bottom. The granular bedding shall have a minimum thickness of one-fourth the outside pipe diameter and shall extend halfway up the pipe barrel at the sides. The remainder of the side fills and a minimum depth of 12 in. (30 cm) over the top of the pipe shall be filled with carefully compacted material.

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ATTACHMENT G

SPECIAL PROVISIONS FOR DISADVANTAGED BUSINESS ENTERPRISES

APPENDIX E CONSTRUCTION BID SPECIFICATIONS SPECIAL PROVISIONS FOR DISADVANTAGED BUSINESS ENTERPRISES MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF MUNICIPAL SERVICES

DISADVANTAGED BUSINESS ENTERPRISE PROGRAM BACKGROUND

In May 2008 a United States Environmental Protection Agency (EPA) rule became effective that changed the Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) Program to a Disadvantaged Business Enterprise (DBE) Program.

For firms to qualify under the old MBE/WBE program they needed to be socially disadvantaged and had to be certified by the Supplier Diversity Office (SDO). Under the new DBE rule, the firms must be both **socially** and **economically** disadvantaged, **citizens of the United States**, and certified as a DBE. Women and certain minorities are presumed to be socially disadvantaged. The economic disadvantage is measured by the owner's initial and continuing personal net worth of less than \$1,320,000.

Because the Clean Water Act requires the use of MBEs and WBEs, these firms will still be utilized in the State Revolving Fund (SRF) Loan Program, but they must also be certified as DBEs.

SDO will continue to be the certifying agency for the SRF program. SDO certifies firms under the federal Department of Transportation program, which is acceptable for use in the SRF program. An additional form has been added to the DBE package to verify that DBEs are owned or controlled by United States citizens.

BID SPECIFICATIONS

I. In this contract, the percentage of business activity to be performed by disadvantaged business enterprise(s) (DBE) shall not be less than the following percentages of the total contract price or the percentage submitted by the contractor in the Schedule of Participation, whichever is greater:

Disadvantaged MBE (D/MBE) <u>4.2%</u>

Disadvantaged WBE (D/WBE) 4.5%

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II. **DEFINITIONS**

For the purpose of these provisions, the following terms are defined as follows:

- A. <u>Awarding Authority</u> Entity that awards a prime contract under a State Revolving Fund loan.
- B. <u>Bidder</u> Any individual, partnership, joint venture, corporation, or firm submitting a price, directly or through an authorized representative, for the purpose of performing construction or construction related activities under a Contract.
- C. <u>Certified DBE</u> A DBE certified by the United States Small Business Administration, under its 8(a) Business Development Program (13 CFR part 124, subpart A) or its Small Disadvantaged Business Program (13 CFR part 124, subpart B); The United States Department of Transportation (DOT), under its regulations for Participation by DBSs in DOT programs (49 CFR parts 23 and 26); or SDO in accordance with 40 CFR part 33; provided that the certification meets the U.S. citizenship requirement under 40 CFR §33.202 or §33.203.
- D. <u>Compliance Unit</u> A subdivision of MassDEP's Affirmative Action Office designated to ensure compliance under these provisions.
- E. <u>Contractor</u> Any business that contracts or subcontracts for construction, demolition, renovation, survey, or maintenance work in the various classifications customarily used in work and that is acting in this capacity under the subject contract.
- F. <u>Construction Related Services</u> Those services performed at the work site ancillary to, and/or in support of, the construction work, such as hauling, trucking, equipment operation, surveying or other technical services, etc. For the purposes hereof, supply and delivery of materials (e.g. pre-cast concrete elements) to the site by a supplier who has manufactured those goods, or substantially altered them before re-sales shall be considered as "construction related services
- G. <u>Construction Work</u> The activities at the work site, or labor and use of materials in the performance of constructing, reconstructing, erecting, demolishing, altering, installing, disassembling, excavating, etc, all or part of the work required by the Contract Documents.
- H. <u>Disadvantaged Business Enterprise</u> (DBE) An entity owned or controlled by a socially and economically disadvantaged individual as described by Public Law 102-389 (42 U.S.C. 4370d) or an entity owned and controlled by a socially and economically disadvantaged individual as described by Title X of the Clean Air Act Amendments of 1990 (42 U.S.C. 7601 note); a Small Business Enterprise (SBE); a Small Business in a Rural Area (SBRA); or a Labor Surplus Area Firm (LAF), a Historically Underutilized Business (HUB) Zone Small Business Concern, or a concern under a successor program.

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- I. <u>Equipment Rental Firm</u> A firm that owns equipment and assumes actual and contractual responsibility for renting said equipment to perform a useful function of the work of the contract consistent with normal industry practice
- J. <u>Good Faith Efforts</u> The race and/or gender neutral measures described in 40 CFR 33, subpart C.
- K. <u>HUBZone</u> A historically underutilized business zone, which is an area located within one or more qualified census tracts, qualified metropolitan counties, or lands within the external boundaries of an Indian reservation.
- L. <u>HUBZone small business concern</u> A small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.
- M. <u>Joint Venture -</u> An agreement between SDO certified DBE and a non-DBE or non-DBE controlled enterprise.
 - 1. A pairing of companies will be considered a DBE joint venture if the SDO certified DBE which is part of the relationship has more than 51% of the profits that are derived from that project.
 - 2. A joint venture between a certified DBE subcontractor and a non DBE subcontractor, in which the DBE for that proportion of the joint venture's contract equal to the DBE participation in the joint venture.
 - 3. Whenever a general bid is filed by a joint venture with a certified DBE participant in the joint venture that does not exercise more than 51% control over management and profits, that joint venture shall be entitled to credit as a DBE for that portion of the joint venture's contract equal to the DBE participation in the joint venture. <u>Minority</u> As deemed by SDO.
- N. <u>Labor surplus area firm (LSAF)</u> A concern that together with its first-tier subcontractors will perform substantially in labor surplus areas (as identified by the Department of Labor in accordance with 20 CFR part 654). Performance is substantially in labor surplus areas if the costs incurred under the contract on account of manufacturing, production or performance of appropriate services in labor surplus areas exceed 50 percent of the contract price.
- O. <u>Letter of Intent</u> Certified document signed by the principal(s) of the DBE with respect to the work to be performed under contract.
- P. <u>Local Government Unit (LGU)</u> A city, town, or municipal district which applies for a loan under the Clean Water Trust Program.
- Q. <u>Material Supplier</u> A vendor certified by SDO as a DBE in sales to supply industry from an established place of business or source of supply, and that vendor.

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- 1. Manufactures goods from raw materials, or substantially utilizes them in the work, or substantially alters them before resale, entitling the general contractor to DBE credit for 100% of the purchase order.
- 2. Provides and maintains a storage facility for materials utilized in the work, entitling the general contractor to DBE credit for 10% of the purchase order
- R. <u>Minority and Women Business Enterprise (M/WBE)</u> Any business concern certified by the SDO as a bona-fide M/WBE. A bona-fide M/WBE is a business whose minority group/women ownership interests are real, which have at least 51% ownership <u>and</u> control over management and operation.
- S. <u>Percent of Total Price</u> Is the percentage to be paid to the DBE, work they perform, as compared to the total bid price
- T. <u>Recipient</u> An agency, person or political subdivision which has been awarded or received financial assistance by the Trust or MassDEP.
- U. <u>Small business, small business concern or small business enterprise (SBE)</u> A concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR part 121.
- V. <u>Small business in a rural area (SBRA)</u> A small business operating in an area identified as a rural county with a code 6-9 in the Rural-Urban continuum Classification Code developed by the United States Department of Agriculture in 1980.
- W. <u>SDO</u> The Supplier Diversity Office.
- X. <u>Subcontractor</u> A company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an award of financial assistance.
- Y. <u>Total Contract Price</u> The total amount of compensation to be paid for all materials, work or services rendered in the performance of the contract
- Z. <u>Trust</u> The Massachusetts Clean Water Trust established by M.G.L. c.29.

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III. <u>REQUIREMENTS FOR CONTRACT AWARD</u>

DBE packages must be submitted by the two lowest bidders on the project. Following bid opening, the LGU shall notify the two lowest bidders to submit DBE packages to the LGU or the LGUs consultant, as directed. By the close of business on the third business day after notification, the two lowest bidders, including a bidder who is a MBE, WBE or DBE, shall submit the following information:

- A. A Schedule of Participation (Form EEO-DEP-190). The <u>Schedule of Participation</u> shall list those certified DBEs the bidder intends to use in fulfilling the contract obligations, the nature of the work to be performed by each certified DBE subcontractor and the total price they are to be paid.
 - 1. A listing of bona-fide services such as a professional, technical, consultant or managerial services, assistance in the procurement of essential personnel, facilities, equipment, materials, or supplies required for performance of the contract, and reasonable fees or commissions charged.
 - 2. A listing of haulers, truckers, or delivery services, not the contractors, including reasonable fees for delivery of said materials or supplies to be included on the project.
- B. A Letter of Intent (Form EEO-DEP-191) for each DBE the bidder intends to use on the project. The Letter of Intent shall include, among other things, a reasonable description of the work the certified DBE is proposing to perform and the prices the certified DBE proposes to charge for the work. A Letter of Intent shall be jointly signed by the certified DBE and the General Contractor who proposes to use them in the performance of the Contract.
- C. Each DBE must also sign and return the DBE Certification of United States Citizenship form to verify that the firm is owned or controlled by a United States citizen.
- D. The SDO "DBE Certification" as prepared by each certified DBE.
- E. A completed Request for Waiver form and backup documentation should the goals not be achieved (See IV below).

IV. REQUIREMENTS FOR MODIFICATION OR WAIVERS.

The bidder shall make every possible effort to meet the minimum requirements of certified DBE participation. If the percentage of DBE participation submitted by the bidder on its Schedule of Participation (EEO-DEP-190) does not meet the minimum requirements, the bid may be rejected by the Awarding Authority and found not to be eligible for award of the contract.

In the event that the bidder is unable to meet the minimum requirements of DBE participation, the bidder shall submit with his/her submittal required in Section III. <u>Requirement of Contract Award</u> a Request for Waiver form (EEO-DEP-490). The Awarding Authority shall review the waiver request to determine if the request should proceed. If approved by the Awarding Authority, the Awarding Authority shall submit the waiver request and supporting documentation, with a recommendation to MassDEP within five days of receipt of the Request for Waiver. MassDEP in conjunction with the project manager, Compliance Unit, will determine whether the waiver will be granted.

The waiver request shall include detailed information as specified below to establish that the bidder has made a good faith effort to comply with the minimum requirements of DBE participation specified in Part I. In addition, the bidder must show that such efforts were undertaken well in advance of the time set for opening of bids to allow adequate response. A waiver request shall include the following:

- A. A detailed record of the effort made to contact and negotiate with the certified DBE, including, but not limited to:
 - 1. names, addresses and telephone numbers of all such companies contacted;
 - 2. copies of written notices(s) which were sent to certified DBE potential subcontractors, prior to bid opening;
 - 3. a detailed statement as to why each subcontractor contacted (i) was not willing to do the job or (ii) was not qualified to perform the work as solicited; and
 - 4. in the case(s) where a negotiated price could not be reached the bidder should detail what efforts were made to reach an agreement on a competitive price;
 - 5. copies of advertisements, dated not less than ten (10) days prior to bid opening, as appearing in general publications, trade-oriented publications, and applicable minority/ women-focused media detailing the opportunities for participation.
- B. MassDEP may require the bidder to produce such additional information as it deems appropriate.
- C. No later than fifteen (15) days after MassDEP receives all required information and documentation, it shall make a decision in writing, whether the waiver is granted and shall provide that determination to the bidder and Awarding Authority. If the waiver request is denied, the facts upon which a denial is based will be set forth in writing. If the waiver request is denied, the bid shall be rejected by the Awarding Authority, or the contract will be determined ineligible for SRF funding.

If a Request for Waiver is denied by MassDEP and the bid is rejected by the Awarding Authority, the Awarding Authority may then move to the second bidder on the project. At the Awarding Authority's discretion, it may collect a DBE package from the third bidder on the project.

V. DISADVANTAGED BUSINESS ENTERPRISES PARTICIPATION

A. <u>Reporting Requirements</u>

- 1. The Contractor's utilization of certified DBEs will be documented based upon submittal of the LGU's monthly Payment Requisitions as reported on Form-2000. The Form-2000 form will show all certified DBEs performing work on the project regardless of any billing activity for that month. For auditing and accounting purposes, the Contractor periodically may be required to submit copies of canceled checks verifying that payments have been made to the certified DBE as listed on the schedule. The Contractor may also be required to submit current schedules on utilization of all DBEs to indicate when their services will commence and be billed for.
- 2. During the life of the Contract, the Contractor's fulfillment of the percentage requirements in Part I shall be determined with reference to the Contract price as follows:
 - A. If the price in the Contract executed exceeds the base bid price (e.g., because an alternate was selected or because unit prices were used in awarding the Contract), the Contractor shall submit for approval by MassDEP a revised Schedule of Participation by certified DBEs satisfying the percentage requirements and such other information concerning additional DBE participation as may be requested by MassDEP.
 - B. If the Contract price increases after execution due to change orders or other adjustments, MassDEP may require the Contractor to subcontract additional work or to purchase additional goods and services from certified DBEs up to the percentages stated in Part I.

VI. <u>COMPLIANCE</u>

- A. If the Schedule or any of the Letters of Intent are materially incomplete or not submitted in a timely manner, the LGU may rescind its vote of award; treat the bid informal as to substance and reject the bid. If the bid is incomplete in any other respect than the Schedule the LGU with the approval of MassDEP may waive the informalities upon satisfactory completion of the required information by the Contractor and the certified DBE as applicable.
- B. If the LGU finds that the percentage of certified DBE participation submitted by the contractor on its Schedule does not meet the percentage requirement in Part I, it shall rescind its vote of award and find such contractor not to be eligible for award of the contract.

- C. The Contractor shall not perform with its own organization, or subcontract to any other primary or subcontractor any work designated for the named certified DBEs on the schedule submitted by the Contractor under Part III without the approval of MassDEP.
- D. A Contractor's compliance with the percentage requirement in Part I shall continue to be determined by reference to the required percentage of the total contract price as stated in Section I even though the total of actual contract payments may be greater or less than the bid price.
- E. If the Contractor for reasons beyond its control cannot comply with Part III in accordance with the Schedule submitted under Part III, Section B, the contractor must submit to MassDEP as soon as they are aware of the deficiency, the reason for its inability to comply. Proposed revisions to the Schedule stating how the contractor intends to meet its obligations under these conditions must be submitted within ten (10) working days of notification.
- F. If the Contractor is becomes aware by any means that that DBE is no longer certified, the Contractor shall immediately notify MassDEP. The Contractor shall use good faith efforts to retain a substitute certified DBE.
- G. If a certified DBE listed by the bidder in its Schedule of M/WBE contractors fails to obtain a performance or payment bond requested by the bidder, said failure shall not entitle the bidder to avoid the requirements of Part III (A). After a bidder has been awarded the contract, he shall not change the certified DBE listed in its Schedule at the time of the award or make any other such substitutions without the written approval of MassDEP.

VII. SANCTIONS

- A. If the Contractor does not comply with the terms of these Special Provisions, the Awarding Authority may (1) suspend any payment for the work that should have been performed by a certified DBE pursuant to the schedule, or (2) require specific performance of the Contractor's obligation by requiring the Contractor to subcontract with a DBE for any contract or specialty item at the contract price established for that item in the proposal submitted by the Contractor.
- B. To the extent that the Contractor has not complied with the terms of these Special Provisions, the Awarding Authority may retain in connection with Estimates and Payments an amount determined by multiplying the bid price of this contract by the percentage in Section I, less the amount paid to DBE's for work performed under the contract and any payments already suspended under VII A.
- C. The Awarding Authority may suspend, terminate or cancel this contract, in whole or in part, or may call upon the Contractor's surety to perform all terms and conditions in the contract, unless the contractor is able to demonstrate his compliance with the terms

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of these Special Provisions, and further deny to the Contractor, the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

- D. In any proceeding involving the imposition of sanctions by the Awarding Authority, no sanctions shall be imposed if the Awarding Authority finds that the contractor has taken every possible measure to comply with these Special Provisions or that some other justifiable reason exists for waiving these Special Provisions in whole or in part.
- E. The contract shall provide such information as is necessary in the judgment of the Awarding Authority to ascertain its compliance with the terms of these Special Provisions.
- F. A contractor shall have the right to request suspension of any sanctions imposed under this section upon demonstrating that he is in compliance with these Special Provisions.

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF MUNICIPAL SERVICES

SCHEDULE OF PARTICIPATION FOR SRF CONSTRUCTION

Project Title:

Project Location:

Disadvantaged Minority Business Enterprise Participation in the SRF Loan Work

		Dollar Value of
Name & Address of D/MBE	Nature of Participation	Participation
1.		
2.		
3.		
	Total D/MBE Commitments	¢
	Þ	
Percentage D/MBE Participation = (Total D/MBE C	%	

Disadvantaged Women Business Enterprise Participation in the SRF Loan Work

Name & Address of D/WBE	Nature of Participation	Dollar Value of Participation
1.		
2.		
3.		
	Total D/WBE Commitment:	\$
Percentage D/WBE Participation = (Total D/WBE C	%	

The Bidder agrees to furnish implementation reports as required by MassDEP to indicate the D/MBEs and D/WBE(s) which it has used or intends to use. Breach of this commitment constitutes a breach of the contract.

Name of Bidder:

Date: _____ By: _____ Signature

NOTE: Participation of a DBE may be counted in only their certified category; the same dollar participation cannot be used in computing the percentage of D/MBE participation and again of D/WBE participation.

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LETTER OF INTENT FOR SRF CONSTRUCTION

This form is to be completed by the D/MBE and D/WBE and must be submitted by the Bidder no later				
than close of business on the third business day after notification by the LGU. A separate form must be				
completed for $\underline{each}\ D/MBE$ and D/WBE	involved in the project.			
Project Title: Project Location:				
ТО:				
	(Name of Bidder)			
FROM:				
(Please Ind	icate Status []D/MBE or []D/WBE)			
° I/we intend to perform work in connecti	on with the above project as (check one):			
[] An individual	[] A partnership			
[] A corporation	[] A joint venture with:			
[] Other (explain):				

^o It is understood that if you are awarded the contract, you intend to enter into an agreement to perform the activity described below for the prices indicated.

DBE PARTICIPATION

	Date of Project		%
Description of Activity	Commencement	\$ Amount	Bid Price
		\$	%

° The undersigned certify that they will enter into a formal agreement upon execution of the contract for the above referenced project.

BIDDER	DBE
(Authorized Original Signature) Date	(Authorized Original Signature) Date
ADDRESS:	ADDRESS:
TELEPHONE #:	TELEPHONE #:
FEIN:	FEIN:
EMAIL ADDRESS:	EMAIL ADDRESS:

ORIGINALS:

- ^o Compliance Mgr. City/Town Project Location
 ^o DEP Program Manager for DEP's AAO Director

* Attach a copy of current (within 2 years) DBE Certification

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DBE CERTIFICATION OF UNITED STATES CITIZENSHIP

For the SRF program, under the EPA Disadvantage Business Enterprise (DBE) Rule, a DBE must be owned or controlled by a socially and economically disadvantaged person that is also a **citizen of the United States** (*See* 40 CFR 33.202). "Ownership" is defined at 13 CFR 124.105 and "control" is defined at 13 CFR 124.106.

DBEs are certified for the SRF program through the Supplier Diversity Office using the federal Department of Transportation (DOT) DBE rules. EPA allows the use of DBEs certified under the DOT rules as long as they are also United States citizens. To ensure compliance with the EPA rule, MassDEP must verify United States citizenship through the completion of the following form for each DBE used on the project.

SRF Project Number

Contract Number

Contract Title

DBE Subcontractor

The undersigned, on behalf of the above named DBE subcontractor, hereby certifies that the DBE firm is either owned or controlled by a person or persons that are citizens of the United States.

Printed Name and Title of DBE Signatory

DBE Signature

Date

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DISADVANTAGED BUSINESS ENTERPRISE PROGRAM DBE SUBCONTRACTOR PARTICIPATION FORM

The United States Environmental Protection Agency (EPA) requires that this form be provided to all subcontractors on the project. At the option of the subcontractor, this form may be filled out and submitted directly to the EPA DBE Coordinator.

NAME OF SUBCONTRACTOR	PROJECT NAME
ADDRESS	CONTRACT NO.
TELEPHONE NO.	E-MAIL ADDRESS
PRIME CONTRACTOR NAME:	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR
Subcontractor	Signature Title/Date	

Equivalent to EPA form 6100-2

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REQUEST FOR WAIVER FOR SRF CONSTRUCTION

Upon exhausting all known sources and making every possible effort to meet the minimum requirements for DBE participation, the Bidder may seek relief either partially or entirely from these requirements by submitting a completed waiver package by the close of business on the third business day after notification by the LGU. Failure to comply with this process shall be cause to reject the bid thereby rendering the Bidder not eligible for award of the contract.

General Information

Project Title:		Project Location:	
Bid Opening (time/date)			
Bidder:			
Mailing Address:			
Contact Person:	Telepho	ne No. <u>()</u>	Ext.

Minimum Requirements

The bidder must demonstrate that good faith efforts were undertaken to comply with the percentage goals as specified. The firm seeking relief must show that such efforts were taken appropriately in advance of the time set for opening bid proposals to allow adequate time for response(s) by submitting the following:

- A. A detailed record of the effort made to contact and negotiate with disadvantaged minority and/or woman owned businesses, including:
 - 1. names, addresses, telephone numbers and contact dates of all such companies contacted;
 - 2. copies of written notice(s) which were sent to DBE potential subcontractors prior to bid opening;
 - 3. a detailed statement as to why each subcontractor contacted (i) was not willing to do the job or (ii) was not qualified to perform the work as solicited; and
 - 4. in the case(s) where a negotiated price could not be reached the bidder should detail what efforts were made to reach an agreement on a competitive price.
 - 5. copies of advertisements, dated not less than ten (10) days prior to bid opening, as appearing in general publications, trade-oriented publications, and applicable minority/women-focused media detailing the opportunities for participation;

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- B. MassDEP may require the bidder to produce such additional information as it deems appropriate.
- C. No later than fifteen (15) days after submission of all required information and documentation, MassDEP shall make a determination, in writing, whether the waiver request is granted and shall provide that determination to the bidder and Awarding Authority. If the waiver request is denied, the facts upon which a denial is based will be set forth in writing.

CERTIFICATION

The undersigned herewith certifies that the above information and appropriate attachments are true and accurate to the best of my knowledge and that I have been authorized to act on behalf of the bidder in this matter.

(authorized original signature)

DATE

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DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF MUNICIPAL SERVICES

STATE REVOLVING FUND LOAN PROGRAM – SCHEDULE OF SUBCONTRACTOR PARTICIPATION

Local Governmental Unit _____

Project Name

SRF Identification Number _____

General Contractor	

Contract Value

The United States Environmental Protection Agency (EPA) requires that all SRF borrowers develop and maintain a list of all MBE/WBE and non MBE/WBE subcontractors on the project.

This form must be completed and returned to MassDEP within 90 days of award of the contract.

Subcontractor	Point of Contact	Mailing Address	Telephone Number	E-Mail Address	MBE	WBE	DBE	Subcontract Value

pspkg 2018-07-11

ATTACHMENT H

PRICE ADJUSTMENTS FOR CERTAIN MATERIALS

APPENDIX H

PRICE ADJUSTMENTS FOR CERTAIN MATERIALS IN CONSTRUCTION PROJECTS MGL CHAPTER 30, SECTION 38A

On November 20, 2013, the Massachusetts Legislature passed a bill (Chapter 150 of the Acts of 2013) requiring that water and sewer projects bid under MGL Chapter 30 Section 39M include price adjustment clauses for **fuel** (both diesel and gasoline), **liquid asphalt** and **portland cement** contained in cast in place concrete for all projects that are advertised for bid after January 1, 2014.

The inclusion of these clauses in the construction contract is the responsibility of the awarding authority, and as such, MassDEP does not dictate what language should be used in the contract. MassDEP will, however, review the contracts to verify that price adjustment clauses have been included.

Awarding Authorities may find value from researching the *price adjustment* information on the Massachusetts Department of Transportation (MassDOT) website at https://www.massdot.state.ma.us/highway/DoingBusinessWithUs/Construction/ PriceAdjustments.aspx. MassDOT requires the use of price adjustment clauses in all of its contracts, and since 2008 has been requiring cities and towns utilizing Chapter 90 road construction funds to also include price adjustment clauses. Because of this, many cities and towns may already have drafted appropriate price adjustment language. This language would be suitable for use in SRF funded contracts. The MassDOT website has extensive information on price adjustments and required contract language for MassDOT contracts.

Attached below is the new Chapter 30, Section 38A language and the contract language that MassDOT uses in its construction contracts. The MassDOT contract language is presented as a possible starting point for borrowers that have not drafted price adjustment clauses. The LGU should consult with their legal and contract staff as appropriate in developing the price adjustment clauses.

Chapter 150 of the Acts of 2013 An Act Relative to Price Adjustment for Certain Materials in Construction Projects

Whereas, the deferred operation of this act would tend to defeat its purpose, which is to establish forthwith certain price adjustments, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

SECTION 1. Chapter 30 of the General Laws is hereby amended by inserting after section 38 the following section:-

Section 38A. Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and

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portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent.

SECTION 2. Section 1 shall apply to projects which are advertised for bid after January 1, 2014.

Approved, November 25, 2013.

MassDOT Price Adjustment Clauses

DOCUMENT 00811 SPECIAL PROVISIONS MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES ENGLISH UNITS Revised: 02/02/2009

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

The Price Adjustment will be based on the variance in price for the liquid asphalt component only from the Base Price to the Period Price. It shall not include transportation or other charges. This Price Adjustment will occur on a monthly basis.

Base Price

The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price detailed below.

Period Price

Please note that, starting December 15, 2008, two sets of period prices will be posted each month on the MassHighway website at http://www.massdot.state.ma.us/. They will be labeled "New Asphalt Period Price Method" and "Old Asphalt Period Price Method".

New Asphalt Period Price Method

The "New Asphalt Period Price Method" is for contracts bid after December 15, 2008 and will show the Period Price of liquid asphalt for each monthly period as determined by MassHighway using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. MassHighway will post this Period Price on this website within two (2) business days following their receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted MassHighway the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.

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Old Asphalt Period Price Method

The "Old Asphalt Period Price Method" Period Price will be for contracts bid on or before December 15, 2008 and will contain liquid asphalt prices as determined by the old or previous method. These prices will continue to be posted on MassHighway's website until all contracts using the "Old Asphalt Period Price Method" Period Price have been closed.

New and Old Asphalt Period Price Methods

The paragraphs below apply to both the New and the Old Asphalt Period Price Methods. The Contract Price of the hot mix asphalt mixture will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M3.11.03.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of tons of hot mix asphalt mixtures placed during each monthly period times the liquid asphalt content percentage times the variance in price between Base Price and Period Price of liquid asphalt.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department approved extension of time.

******** END OF DOCUMENT *******

DOCUMENT 00812 SPECIAL PROVISIONS MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE – ENGLISH UNITS Revised: 01/26/2009

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

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The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department's web site (http://www.massdot.state.ma.us/) for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made\ during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS		
	Diesel	Gasoline	
Excavation: and Borrow Work:	0.29 Gallons / CY	0.15 Gallons / CY	
Items 120, 120.1, 121, 123, 124, 125,			
127, 129.3, 140,			
140.1, 141, 142, 143, 144., 150, 150.1,			
151 and 151.1			
(Both Factors used)			
Surfacing Work:	2.90 Gallons / Ton	Does Not Apply	
All Items containing Hot Mix Asphalt			

******* END OF DOCUMENT *******

DOCUMENT 00814 SPECIAL PROVISIONS PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the

Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

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The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the **Construction Economics** section of *ENR Engineering News-Record* magazine or at the ENR website http://www.enr.com under **Construction Economics**. The Period Price will be posted on the MassHighway website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01.

No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

END OF DOCUMENT

ATTACHMENT I

DIESEL RETROFIT PROGRAM

APPENDIX B DIESEL RETROFIT PROGRAM

The Department of Environmental Protection ("DEP") has developed the Diesel Retrofit Program in response to increasing public health concerns with the emissions from diesel engines and vehicles.

Diesel Construction Equipment Standard

All diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract (hereinafter "Diesel Construction Equipment") must have the following pollution control device installed unless exempt as provided below:

- 1. Emission control technology verified by U.S. Environmental Protection Agency ("EPA") or the California Air Resources Board ("CARB") for use with non-road engines;
- 2. Emission control technology verified by EPA or CARB for use with on-road engines provided that such equipment is operated with diesel fuel that has no more than 15 parts per million sulfur content (i.e. Ultra Low Sulfur Diesel fuel); or
- 3. Emission control technology certified by the manufacturer that such technology meets or exceeds the emission reductions provided by on-road or off-road emission control technology verified by EPA or CARB, i.e. that a Diesel Oxidation Catalyst is achieving the following minimum emission reductions: particulate matter 20%; carbon monoxide 40%; volatile organic compounds 50%; or a Diesel Particulate Filter is achieving a minimum of 85% emission reductions for particulate matter.

Emission control devices, such as oxidation catalysts or particulate filters, shall be installed on the exhaust system side of the Diesel Construction Equipment. The Contractor shall be responsible to insure that the emissions control technology is operated, maintained, and serviced as recommended by the manufacturer.

For the latest up-to-date list of EPA verified-technologies, see: https://www.epa.gov/verified-diesel-tech For the latest up-to-date list of CARB verified technologies, see: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

Exemptions

The following Diesel Construction Equipment shall be exempt from the standard above. The Contractor shall include such Diesel Construction Equipment in the required recordkeeping:

- 1. Diesel Construction Equipment not owned by the Contractor and used in the performance of the work under this Contract for 30 calendar days (cumulative days but not necessarily consecutive) or less;
- 2. Unless otherwise exempt, additional Diesel Construction Equipment originally not anticipated to be used under the Contract or used as permanent replacement after the work under the Contract has commenced, for 15 calendars days from the date such Diesel Construction Equipment is brought on site;

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APPENDIX B (cont.) DIESEL RETROFIT PROGRAM

- 3. Diesel Construction Equipment with an engine that meets the EPA particulate matter (PM) Tier emission standards in effect at the start of the Contract for non-road diesel engines for the applicable engine power group_(e.g., as of January 1, 2009, a piece of Diesel Construction Equipment with a Tier 3 engine is exempt from meeting the standard until the piece of Diesel Construction Equipment is available with a Tier 4 engine) provided that if such emissions standards are superseded during the Contract then such Diesel Construction Equipment must be retrofitted in accordance with the standards above prior to the end of the Contract;
- 4. A large crane (e.g. a sky crane or link belt crane which is responsible for critical lift operations) if such device would adversely affect the operation of the crane provided the Contractor submits to the municipality's project engineer written technical justification documenting the adverse impact on operation; and
- 5. Diesel Construction Equipment that the project engineer has determined is necessary to control a compelling emergency including but not limited to, the need for rescue vehicles or other equipment to prevent harm to human beings or additional equipment required to address a catastrophic emergency such as structure collapse or imminent collapse. After the compelling emergency is controlled, such non-compliant equipment must be removed from the Contract site and may not be used in further performance of the work under this Contract. Meeting Contract deadlines is not a compelling emergency.

Contractor Certification

Each bidder shall submit as part of its bid, the Statement of Intent to Comply. Within 10 days of being notified that it has been awarded a contract, the bidder and each of its Contractors and Subcontractors shall submit a Diesel Retrofit Program Contractor Certification. Each such Certification shall contain the following information for each piece of Diesel Construction Equipment:

- 1. Contractor or Subcontractor name;
- 2. Equipment type, make, model;
- 3. Vehicle Identification Number or VIN;
- 4. Engine model and year of manufacture;
- 5. Engine HP rating;
- 6. Emission Control Device (ECD) type (Diesel Oxidation Catalyst or Diesel Particulate Filter);
- 7. ECD make, model, and manufacturer;
- 8. ECD EPA or CARB Verification Number or manufacturer's certification that the DOC or DPF meets or exceeds emission reductions provided by similar emission control technology verified by EPA or CARB;
- 9. ECD installation date;
- 10. Type of fuel to be used; and
- 11. Whether the equipment is owned or rented.

Recordkeeping

Each Contractor and Subcontractor shall maintain detailed records of all Diesel Construction Equipment used under the Contract, including the dates and duration times the Diesel Construction Equipment is

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APPENDIX B (cont.) DIESEL RETROFIT PROGRAM

used at the Contract site. Records shall be available for inspection by DEP. Each Contractor and Subcontractor shall notify DEP within 48 hours of any new Diesel Construction Equipment brought onto the Contract site.

For Diesel Construction Equipment that has an emissions control device with a manufacturer's certification, the Contractor shall maintain records of all supporting emissions test data and test procedures. If upon review the emissions reductions are not supported by the test data and test procedures, then the emissions control device may need to be replaced with a compliant retrofit device.

Project Regulatory Agreement

The following language shall be included section 4 (Covenants of the Borrower) of the municipality's Project Regulatory Agreement if it receives funds from the State Revolving Fund:

The Borrower shall require each Contractor and Subcontractor to submit the Diesel Retrofit Program Contractor Certification to DEP and the Borrower prior to commencing work on the Project. The Borrower shall not allow any Contractor or Subcontractor to commence work at the Project site prior to submitting such Certification.

APPENDIX B (cont.) DIESEL RETROFIT PROGRAM

STATEMENT OF INTENT TO COMPLY

This form must be signed and submitted by the bidder as part of the bid.

Local Governmental Unit		SRF Project No.
Contract No.	Contact Title	
Bidder		

The undersigned, on behalf of the above-named Bidder, agrees that, if awarded the Contract:

- 1. the Bidder shall comply with the Massachusetts Department of Environmental Protection's ("MassDEP") Diesel Retrofit Program by ensuring that all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract are equipped or retrofitted with a pollution control device in accordance with the Diesel Retrofit Program Standard;
- 2. the Bidder shall require all Subcontractors to comply with MassDEP's Diesel Retrofit Program by ensuring all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract are equipped or retrofitted with a pollution control device in accordance with the Diesel Retrofit Program Standard; and
- 3. The Bidder shall submit and shall require each Subcontractor to submit a Diesel Retrofit Program Contractor Certification (form attached) with a Diesel Retrofit List to MassDEP Municipal Services and the Bidder within 10 days of the bidder being notified that it has been awarded the Contract. The Bidder shall require each Subcontractor to update such Certification and List within 2 days of using additional Diesel Construction Equipment on the project under the Contract.

(Signature of Bidder's Authorized Representative)

(Date)

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APPENDIX B (cont.) DIESEL RETROFIT PROGRAM CONTRACTOR CERTIFICATION

Each Contractor and its Subcontractor(s) must sign and submit this form to DEP DMS project engineer, 5 th Floor, MassDEP, One Winter Street, Boston, MA 02108 and the Municipality within 10 days after the Contractor is notified that it is awarded the Contract.			
Local (Governmental Unit	SRF Project No.	
Contra	ct No.	Contact Title	
Contractor			
Т		an authorized signatory for	
i,, an aumonized signatory for,			
hereby certify that any and all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract (hereinafter "Diesel Construction Equipment") have pollution control devices, such as oxidation catalysts or particulate filters, installed on the exhaust system side of the diesel combustion engine equipment in accordance with the Diesel Retrofit Program Standard.			
I am submitting on behalf ofa a list of all said Diesel Construction Equipment, labeled "Diesel Retrofit List," that will be used in connection with this Contract by I hereby certify that the information on the attached Diesel Retrofit List is correct and accurate as of the date of signature. The List includes the following information for each piece of Diesel Construction Equipment:			
1 Equipment type make model:			
2	 Equipment type, make, model, Vehicle Identification Number or VIN: 		
<u> </u>	3. Engine model and vear of manufacture:		
4.	4. Engine HP rating;		
5.	5. Emission Control Device ("ECD") type (Diesel Oxidation Catalyst or Diesel Particulate Filter);		
6. 7.	 ECD make, model, and manufacturer; ECD EPA or CARB Verification Number or manufacturer's certification that the DOC or DPF meets or exceeds emission reductions provided by similar emission control technology verified by EPA or CARB; 		
8.	ECD installation da	ite;	
9.	Type of fuel to be u	ised; and	
10.	Whether the equipm	nent 1s owned or rented.	

APPENDIX B (cont.)

DIESEL RETROFIT PROGRAM CONTRACTOR CERTIFICATION

shall notify DEP within 4	8 hours of any new Diesel Construction Equipment			
brought onto the Contract site.	shall maintain detailed records of all			
Diesel Construction Equipment used at the Contract site, including the dates and duration times the				
Diesel Construction Equipment is used at the Contr	act site shall make such			
records available for inspection by DEP.	shall ensure that the emissions control			
technology for each piece of Diesel Construction Equipment is operated, maintained, and serviced as				
recommended by the manufacturer.	shall retrofit prior to the end of the			
Contract any Diesel Construction Equipment no longer exempt from meeting the Diesel Construction				
Equipment Standard under exemption 3 (because it had an engine that met the EPA particulate matter				
(PM) Tier emission standards currently in effect at the start of the Contract for non-road diesel engines				
for the applicable engine power group and such emissions standards were superseded during the				
Contract).				

I acknowledge that this certificate is being furnished as a requirement under this Contract and is subject to applicable State and federal laws, both criminal and civil. Signed under pains and penalty of perjury on this date _____.

Signature_____

Name: _____

Title:

ATTACHMENT J

OWNER'S GENERAL CONDITIONS

SUPPLEMENT "C"

- 1. This form supplements the Town of West Springfield, "Contract and General Conditions," and applies only to contracts for the construction, reconstruction, alteration, remodeling or repair of <u>public</u> works or <u>public buildings</u>.
- 2. Wherever the law requires one contracting with a city or town to be bonded, such obligation shall be understood to be a term and condition of this Contract. The Contractor agrees to secure such bond (where required) and provide an original thereof to the Town of West Springfield prior to the commencement of performance.
- 3. Equality:
 - 3.1 In the case of a Closed Specification written for a specific item or items to be furnished under the Base Bid, such Specifications shall, as applicable, be in compliance with the Massachusetts General Laws, Chapter 30F Section 39M and Chapter 149, Section 44A et seq.
 - 3.2 Where the name of an item, material or manufacturer is mentioned in the Specifications or on the Drawings, except as above noted, the intent is to establish a standard and in no way should be construed to exclude any item or manufacturer not mentioned by name, but whose product meets the Specifications as to design, utility and quality. Final decision shall rest with the Project Representative as to its acceptability.
- 4. Change orders to contracts governed by General Laws Chapter 30B may not increase the quantity of goods or services provided by more than twenty five percent (25.0%), in compliance with Section 13 of Chapter 30B.
- 5. The Contractor will carry out the obligations of this Contract in full compliance with all of the requirements imposed by or pursuant to General Laws Chapter 151, Section 1, et seq. (Minimum Wage Law) and any executive orders, rules, regulations, and requirements of the Commonwealth of Massachusetts as they may from time to time be amended. The Contractor will at all times comply with the wage rates as determined by the Commissioner of the Department of Labor and Industries, under the provisions of General Laws Chapter 149. Section 26 to 27D (Prevailing Wage) as shall be in force and as amended. The Contractor will provide documentation of compliance with prevailing wage law to the Town.
- 6. The Contractor shall continuously maintain adequate protection of all work from damage and shall protect the property of the Town and others, including adjacent property, from injury or loss arising in connection with the Contract. The Contractor shall make good any such damage, injury or loss, except as may be directly due to errors in the Contract Document or caused by agents or employees of the Town, or due to causes beyond the Contractor's control and not the Contractor's fault or negligence.
- 7. The Contractor shall take all necessary precautions for the safety of employees on the work, and shall comply with all applicable provisions of federal, state and local

laws and codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. The Contractor will erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workers and the public, shall post danger signs warning against the hazards created by such features of construction as pits, protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, and falling materials; and shall designate a responsible member of its organization on the work, whose duty shall be the prevention of accidents.

- 8. The Town shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide suitable accommodations for such access.
- 9. The Contractor shall appoint a competent superintendent and any necessary assistants satisfactory to the Town.
- 10. The Contractor shall give efficient supervision to the work, using its best skill and attention. The Contractor shall carefully study and compare all drawings, specifications and other instructions and shall at once report to the Town any error, inconsistency or omission which shall be discovered, but will not be liable to the Town for any damage resulting from errors or deficiencies in the Contract Documents. Included in this responsibility shall he supervision of all work performed by subcontractors on the work.
- 11. If the Contractor should neglect to prosecute the work properly, or fail to perform the contract or any of its provisions, the Town, upon three days written notice, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.
- 12. Inspection by the Town's Project Representative:
 - The Town shall have the right to designate a Project Representative who 12.1 may make periodic visits to the site to familiarize the Town 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. The Project Representative will not be required to make exhaustive or continuous onsite inspections to check the quality or quantity of the work, and will not be responsible for the Contractor's failure to carry out the construction work in accordance with the Contract Documents. During such visits and on the basis of these observations while at the site, the Project Representative will keep the Town informed on the progress of the work, will endeavor to guard the Town against defects and deficiencies in the work of contractors, and may condemn structural work as failing to conform to the Contract Documents. The Project Representative shall have authority to act on behalf of the Town only to the extent expressly delegated by the Town, which shall be shown to the Contractor, and shall have authority to stop the work whenever such stoppage may reasonably be necessary to insure the proper execution of the Contract.

12.2 In connection with the work, the Project Representative shall not be responsible for construction methods, means, techniques, sequences or procedures employed by the Contractor or the Contractor's safety programs, requirements, regulations or precautions.

13. Decisions of the Project Representative:

- 13.1 The Project Representative shall, within a reasonable time, make decisions on all claims of the Town or the Contractor and on all other matters relating to the execution and progress of the structural work or the interpretation of the Contract Documents.
- 13.2 The Project Representatives decision in matters relating to the project, shall he final, if within the terms of the Contract Documents.
- 13.3 If, however, the Project Representative fails to render a decision, within ten (10) days after the parties have presented their evidence, either party may then avail itself of the remedies provided in this contract or available to it by law. If the Project Representative renders a decision after such remedies have commenced, such decision may be entered as evidence but shall not disturb or interrupt such proceedings except where such decisions is acceptable to the parties concerned.

14. Use of Premises by the Contractor:

- 14.1 The Contractor shall confine its apparatus, the storage of materials, and the operations of its workmen to limits indicated by law, by-laws, permits or directions of the Town and shall not unreasonably encumber the premises with its materials.
- 14.2 The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

15. <u>Maintenance of Premises:</u>

The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by its employees or work, and at the completion of the work it shall remove all its rubbish from and about the work site and all its tool, scaffolding and surplus materials and shall leave its work "broom-clean", or its equivalent, unless more exactly specified. In case of dispute, the Town may remove the rubbish and charge the cost to the several contractors, as the Town shall determine to be just. Any paved areas disturbed during construction shall be swept by a motorized highway sweeper every two (2) work days.

16. <u>Right to Terminate:</u>

If the Contractor should (1) be adjudged a bankrupt, (2) make a general assignment for the benefit or creditors, (3) have a receiver appointed on account of its solvency, (4) persistently or repeatedly refuse or fail to supply enough personnel and resources to perform the contract, (5) fail to make prompt payment to subcontractors or to providers of materials or labor, (6) persistently disregard

laws and regulations or lawful directives of the Town, or (7) be guilty of a substantial violation of any provision of the Contract, then the Town may, without prejudice to any other right or remedy and after giving the Contractor (and any surety) seven days written notice, terminate the contract and the employment of the Contractor and take possession of the premises and of all materials, tools and appliance thereon and finish the work by whatever method it deems appropriate.

In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract price shall exceed the expense of finishing the work, including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the Contractor. If such expenses shall exceed such unpaid balances, the Contractor shall pay the difference to Town.

- 17. Progress Payments:
 - 17.1 The Contractor shall submit to the Town and itemized Application for Payment, supported to the extent required by the Town by invoices or other vouchers, showing payments for materials and labor, payments to Subcontractors and such other evidence of the Contractor's right to payment.
 - 17.2 The Contractor shall, before the first application, submit to the Town a schedule of values of the various parts of the work, including quantities if requested, aggregating the total sum of the Contract, divided so as to facilitate payments to Subcontractors, made out in such form as the Town and the Contractor may agree upon, and, if required, supported by such evidence as to its correctness. This schedule, when approved by the Town, shall be used as basis for payment, unless it is found to be in error. If applying for payments, the Contractor shall submit a statement based upon this schedule.

18. <u>Withholding of Payments:</u>

18.1 The Town may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any payment to such extent as may be necessary

in its reasonable opinion to protect the Town of West Springfield from loss on account of:

- 18.1.1 Defective work not remedied.
- 18.1.2 Claims filed or reasonable evidence indicating probable filing of claims.
- 18.1.3 Failure of the Contractor to make payments promptly to Subcontractors or for material or labor.
- 18.1.4 A reasonable doubt that the Contract can be completed for the balance then unpaid.
18.1.5 Damage to another contractor.

18.2 Withholding of payments shall be in strict compliance with statutory requirements.

19. Damages:

Should either party to the Contract suffer damages because of any wrongful act or neglect of the other party, or of anyone employed by him, a claim shall be made in writing to the party liable within a reasonable time of the first observance of such damage and not later than the Final Payment, except as expressly stipulated otherwise in the case of faulty work or materials, and shall be adjusted by agreement, or by recourse to remedies provided by law or by provisions of the contract.

20. <u>Liens</u>:

Neither the Final Payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Town a complete release of all liens arising out of the Contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that as far as it has knowledge or information, the releases and receipts include all the labor and material for which a lien could he filed. The Contractor shall comply with all statutory provisions of the General Laws of the Commonwealth of Massachusetts with regard to liens, Chapter 254 and 149 as amended (as a minimum requirement).

21. <u>The Contractors Mutual Responsibility</u>:

Should the Contractor cause damage to any separate contractor on the work, the Contractor agrees, upon due notice, to settle with such contractor by agreement, or by recourse to remedies provided by law or by the provisions of the contract. If such separate contractor sues the Town on account of any damage alleged to have been sustained, the Town shall notify the Contractor, who shall defend such proceedings at the Town's expense and, if any judgment against the Town arises there from, the Contractor shall pay or satisfy it and pay all costs incurred by the Town.

22. <u>Separate Contracts</u>:

- 22.1 The Town reserves the right to let other Contracts in connection with this work under similar General Conditions. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with theirs.
- 22.2 If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Town any defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to inspect and report shall constitute an acceptance of the other contractor's

work as fit and proper for the reception of its work except as to defects which may develop in the other contractor's work after the execution of its work.

22.3 To insure the proper execution of its subsequent work, the Contractor shall measure work already in place and shall at once report to the Town any discrepancy between the executed work and the Drawings.

23. <u>Subcontracts:</u>

- 23.1 All subcontracts shall be awarded in conformity with the requirements of the General Laws, Commonwealth of Massachusetts, Chapter 149, Sections 44A to 44L inclusive.
- 23.2 The Contractor agrees that it is as fully responsible to the Town for the acts and omissions of its Subcontractors and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.
- 23.3 Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and the Town.

24. <u>Contractor-Subcontractor Relations:</u>

The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Agreement, the General Conditions of the Contract, the Supplementary General Conditions, the Drawings and Specifications, as far as applicable to its work, including the provisions of the General Laws, Commonwealth of Massachusetts, Chapter 149, Section 44A, et seq.

25. <u>Indemnification:</u>

- 25.1 The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any or all persons, including the Contractor's employees, and for any and all damage to property caused by, resulting from or arising out of any act, omission, or neglect on the part of the Contractor or of any Subcontractor or of anyone directly or indirectly employed by any of them, or of anyone for whose acts any of them may be liable in connection with operations under the Contract.
- 25.2 The Contractor further agrees to indemnify and hold harmless the Town, including the agents, employees and representative of either, from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of , use resulting there from and (b) is caused in whole or in part by any negligent 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.

- 25.3 The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the work resulting from any act, omission, neglect, or misconduct in the manner or method of executing the work or due to the non-execution of the work or at any time due to defective work or materials.
- 25.4 In any and all claims against the Town or any of their 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 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 Workmen's Compensation Acts, disability benefit acts or other employee benefit acts.
- 25.5 The obligations of the Contractor under this paragraph shall not extend to the liability of the Town, its agents or employees arising out of (a) the preparation or approval of Maps, Drawings, Opinions, Reports, Surveys, Change Orders, Designs or Specification, or (b) the giving of or the failure to give directions or instruction by the Town, its agents or employees provided such giving or failure to give directions or instructions is the primary cause of the injury or damage.
- 26. The Contractor's Insurance:
 - 26.1 The Contractor shall purchase and maintain such insurance as will protect the Contractor from claims set forth below which may rise out of or result from the Contractor's operation under the Contract, whether such operation be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.
 - 26.1.1 Claims under Worker's Compensation, disability benefit and other similar employee benefits acts;
 - 26.1.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of its employees and claims insured by usual personal injury liability coverage;
 - 26.1.3 Claims for damage because of bodily injury, sickness or disease, or death of any person other than its employees, and claims insured by usual personal injury liability coverage; and
 - 26.1.4 Claims for damages because of injury to or destruction of tangible property, including loss of use resulting there from.

26.2 The insurance required by the above shall be written for not less than the following minimum limits of liability:

26.2.1 Worker's Compensation Act requirements

26.2.2 General Liability -

Comprehensive Form:	\$1,000,000;
Premises and Operations:	\$1,000,000;
Explosion and Collapse Hazard:	\$1,000,000;
Underground Hazard:	\$1,000,000;
Explosion and Collapse Hazard:	\$1,000,000;
Underground Hazard:	\$1,000,000;
Products/Completed Operations Hazard:	\$1,000,000;
Contractual Insurance:	\$1,000,000;
Board From Property Damage:	\$1,000,000;
Independent Contractors:	\$1,000,000;
Personal Injury:	\$1,000,000;

Automobile Liability:

Comprehensive Form:	\$1,000,000;
Owned:	\$1,000,000;
Hired:	\$1,000,000;
Non-Owned:	\$1,000,000;
Excess Liability	(As needed to provide
	\$1,000,000 coverage minimum
	for each coverage listed in
	this paragraph).

- 26.3 The above insurance policies shall also be subject to the following requirements:
 - 26.3.1 Insurance coverage for the Contractor's Comprehensive General Liability, as specified under the foregoing paragraph and for the Town's Protective Liability, as hereinafter specified under Paragraph entitled "Protective Liability Insurance" shall be written by one and the same insurance company to avoid the expense of duplicate and/or overlapping coverage and to facilitate and expedite the settlement of claims.
 - 26.3.2 Certificates of Insurance acceptable to the Town shall be addressed to and filed with the Town prior to commencement of the work. Renewal certificates shall be addressed to and filed with the Town at least ten (10) days prior to the expiration date of required polices.
 - 26.3.3 No insurance coverage shall be subject to cancellation without at least thirty (30) days prior written notice forwarded by

registered or certified mail to the Town. The Town shall also be notified of the attachment of any restrictive amendments to the policies.

- 26.3.4 All Certificates of Insurance shall contain true transcripts from the policies, authenticated by the proper officer of the insurer, evidencing in particular those incurred, the extent of the coverage, the location and operations to which the insurance applies, the expiration date and the above mentioned notice clauses.
- 26.3.5 All premium costs shall be included, in the Contractor's bid.
- 27. <u>Protective Liability Insurance:</u>
 - 27.1 The Contractor shall purchase and maintain such insurance as will protect the Town from claims which may arise from operations under the Contract, including operations performed for the named insured by independent contractors and general inspection thereof by the named insured.
 - 27.2 The Contractor shall also purchase and maintain such insurance as will protect both the Town against Automobile Non-Ownership Liability in connection with the Contractor's operations under the Contract, whether such operations be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.
 - 27.3 The limits of liability for coverage required under the preceding paragraphs shall be as specified under the provisions hereof governing the Contractor's General Liability Policy.
 - 27.4 The said coverage shall not extend to the liability of the Town, its agents or employees arising out of (a) the preparation or approval of Maps, Drawings, Opinions, Reports, Surveys, Change Orders, Designs or Specification, or (b) the giving of or the failure to give directions or instructions by the Town, its agents or employees provided such giving or failure to give instructions is the primary cause of the injury or damage.
 - 27.5 The above policies shall name the Town as the insured, including its employees, agents and representatives.
 - 27.6 The premium costs shall be included in the Contractor's bid and the policies issued hereunder shall be assessed to and filed with the Town.
- 28. <u>Property Insurance</u>:
 - 28.1 The Town may purchase and maintain property insurance upon the entire work at the site, including labor, materials, structure and contents, to the full insurable value thereof. This insurance shall include the interest of the Town, the Contractor, Subcontractors in the work and shall insure against the perils of Fire, Extended Coverage, Vandalism and Malicious Mischief.

- 28.2 In view of its exposure to builder's risk hazards, it shall be the Town's responsibility to purchase and maintain such other insurance coverage as it may deem necessary and coverage of its liability to the Contractor. The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the work resulting from any act omission, neglect, or misconduct in the manner or method of executing the work or due to the non-execution of the work or at any time due to defective work or materials.
- 28.3 Copies of the above policy or a certificate of such insurance coverage shall be filed with the Contractor and Project Representative before an exposure to loss may occur.

This Agreement is intended to take effect as a sealed instrument. Witness our hands and seals hereto:

Dated:_____

The Town of West Springfield Chief Procurement Officer/Mayor

Town Accountant/Chief Financial Officer Certified as to Appropriation

Town Attorney As to Form

The Contractor by: _____

ATTACHMENT K

WEST SPRINGFIELD CONSERVATION COMMISION ORDER OF CONDITIONS

Provided by MassDEP: MassDEP File #:330-0371 eDEP Transaction #:1162930 City/Town:WEST SPRINGFIELD

A. General Information WEST SPRINGFIELD 1. Conservation Commission 2. Issuance $\overline{\mathbf{v}}$ OOC b.□ Amended OOC a. 3. Applicant Details a. First Name **JAMES** b. Last Name CZACH c. Organization WEST SPRINGFIELD DPW d. Mailing Address 26 CENTRAL STREET e. City/Town WEST SPRINGFIELD f. State MA g. Zip Code 01089 4. Property Owner a. First Name **JAMES** b. Last Name CZACH c. Organization WEST SPRINGFIELD DPW d. Mailing Address 26 CENTRAL STREET e. City/Town WEST SPRINGFIELD f. State MA g. Zip Code 01089 5. Project Location a.Street Address PIPER ROAD WEST SPRINGFIELD c. Zip Code 01089 b.City/Town d. Assessors e. Parcel/Lot# LINEAR LINEAR Map/Plat# 42.14831N g. Longitude f. Latitude 72.65257W 6. Property recorded at the Registry of Deed for: a. County **b.** Certificate c. Book d. Page HAMPDEN 38484 7.Dates a. Date NOI Filed : 10/15/2019 b. Date Public Hearing 11/13/2019 c. Date Of 11/13/2019 Closed: Issuance: 8. Final Approved Plans and Other Documents

a. Plan Title: b. Plan Prepared by: c. Plan Signed/Stamped by: d. Revised Final Date: e. Scale:

Provided by MassDEP: MassDEP File #:330-0371 eDEP Transaction #:1162930 City/Town:WEST SPRINGFIELD

?TOWN OF WEST SPRINGFIELD, DEPARTMENT OF PUBLIC WORKS, BIRNIE AVENUE/ PIPER ROAD AREA SEWER EXPANSION PROJECT, CWSRF ? 4513?, DAVID GONCALVES PREPARED BY MOTT MACDONALD., SIGNED AND STAMPED BY DAVID G. GONCALVES, P.E. & DATED OCTOBER 11, 2019

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Provided by MassDEP: MassDEP File #:330-0371 eDEP Transaction #:1162930 City/Town:WEST SPRINGFIELD

?NOTICE OF INTENT: BIRNIE **AVENUE/ PIPER** ROAD AREA SEWER **EXPANSION** PROJECT, MASSACHUSETTS WETLANDS PROTECTION ACT 310 CMR 10.00, OCTOBER 10, 2019, WEST SPRINGFIELD DEPARTMENT OF DAVID GONCALVES PUBLIC WORKS (APPLICANT)? PREPARED BY MOTT MACDONALD, RECEIVED OCTOBER 11, 2019. SIGNED BY JAMES CZACH, APPLICANT AND DAVID G. GONCALVES, REPRESENTATIVE, 10/11/19.

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

a. 🔽 Public Water Supply	b. 🔽 Land Containing Shellfish	c. Prevention of Pollution
d. 🗹 Private Water Supply	e. 🗹 Fisheries	f. 🔽 Protection of Wildlife Habitat
g. 🗹 Ground Water Supply	h. 🔽 Storm Damage Prevention	i. 🗹 Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. I The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this

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Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands WPA Form 5 - Order of Conditions

Provided by MassDEP: MassDEP File #:330-0371 eDEP Transaction #:1162930 City/Town:WEST SPRINGFIELD

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control. **Denied** because:

- b.□ The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. A **description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c. ☐ The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).
- 3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a).

```
a. linear feet
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50

Inland Resource Area Impacts: (For Approvals Only):				
Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ⊏ Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. □ Land under Waterbodies and Waterways	a. square feet	b. square feet	c. square feet	d. square feet
	e. c/y dredged	f. c/y dredged		
7. ☐ Bordering Land Subject to Flooding	a. square feet	b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8. ☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. □ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	1 	1	1	1

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	g. square feet	h. squa	re feet i.	square feet	j. square feet
Coastal Resource Area Impacts:					
Resource Area	Pro Alte	posed eration	Permitted Alteration	Propose Replacem	d Permitted ent Replacement
10. □ Designated Port Areas	Indicate size	under La	and Under the	e Ocean, belov	V
11. □ Land Under the Ocean	a. square fee	$\frac{1}{b. square}$	are feet		
	c. c/y dredge	$\overline{d} d. c/y d$	dredged		
12. Barrier Beaches	Indicate size	under C	oastal Beache	es and/or Coas	stal Dunes below
13.□ Coastal Beaches	a. square fee	et b. squa	are feet c. c/y	nourishment	d. c/y nourishment
14.□ Coastal Dunes	a. square fee	et b. squa	are feet c. c/y	v nourishment	d. c/y nourishment
15.□ Coastal Banks	a. linear feet	t b. line	ar feet		
16.	a. square fee	et b. squa	are feet		
17.□ Salt Marshes	a. square fee	et b. squa	are feet c. squ	uare feet	d. square feet
18. □ Land Under Salt Ponds	a. square fee	et b. squa	are feet		
	c. c/y dredge	ed d. c/y o	dredged		
19. □ Land Containing Shellfish	a. square fee	et b. squa	are feet c. squ	uare feet	d. square feet
20. Fish Runs	Indicate size Ocean, and/o above	under Cor inland	oastal Banks, Land Under V	inland Bank, I Vaterbodies ar	Land Under the ad Waterways,
	c. c/y dredge	ed d. c/y o	lredged		
21.□ Land Subject to Coastal Storm Flowage	a. square fee	et b. squa	are feet		

22.

□ Restoration/Enhancement (For Approvals Only)

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c & d or B.17.c & d above, please entered the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

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Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands WPA Form 5 - Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

23.

\Box Streams Crossing(s)

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

a. number of new stream crossings

b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act The following conditions are only applicable to Approved projects

- 1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
- 2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
- 3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
- 4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
 - a. the work is a maintenance dredging project as provided for in the Act; or
 - b. the time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
- 5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order.
- 6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not exceed the issuance date of the original Final Order of Conditions.
- 7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
- 8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
- 9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..
- 10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"

[or 'MassDEP"]

File Number :"330-0371"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.

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Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands WPA Form 5 - Order of Conditions

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- 12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
- 13. The work shall conform to the plans and special conditions referenced in this order.
- 14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
- 15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
- 16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
- 17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
- 18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

- 19. The work associated with this Order(the "Project") is (1) 🔽 is not (2) □ subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;
 - a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
 - b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i*. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii*. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii*. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv*. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v*. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

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c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

- d) Post-construction pollution prevention and source control shall be implemented in accordance with the longterm pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.
- g) The responsible party shall:

 Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and

3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- 1) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for

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wildlife passage.

Special Conditions:

SEE APPENDIX "A" SPECIAL CONDITIONS 330-0371, SEWER EXTENSION PROJECT, TOWN OF WEST SPRINGFIELD DPW

Mas	ssachusetts Department of Environmental	Provided by MassDEP: MassDEP File #:330.0371
Prot Bure	tection eau of Resource Protection - Wetlands	eDEP Transaction #:1162930 City/Town:WEST SPRINGEIELD
WP.	A Form 5 - Order of Conditions	City/Town. wEST SI KINGI IEED
D. Fi	ndings Under Municipal Wetlands Bylaw or Ordin	ance
1.Is a	municipal wetlands bylaw or ordinance applicable? Yes	I▼ No
2. <u>The</u> a.⊤	Conservation Commission hereby(check one that applies DENIES the proposed work which cannot be conditione to meet the standards set forth in a municipal ordinance or bylaw specifically:	<u>):</u> 2d
	1. Municipal Ordinance or Bylaw	- 2. Citation
The pro are	erefore, work on this project may not go forward unless a ovides measures which are adequate to meet these standard e necessary to comply with a municipal ordinance or bylaw	nd until a revised Notice of Intent is submitted which ds, and a final Order or Conditions is issued. Which v:
b.	APPROVES the proposed work, subject to the following additional conditions.	
	1. Municipal Ordinance or	Citation ———

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:

E. Signatures

This Order is valid for three years from the date of issuance, unless otherwise specified pursuant to General Condition #4. If this is an Amended Order of	11/13/2019	
Conditions, the Amended Order expires on the same date as the original Order of	1. Date of Original Order	
Please indicate the number of members who will sign this form. This Order must	6	
be signed by a majority of the Conservation Commission.	2. Number of Signers	

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The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signatures:	Danny Hannoush
Kevin Cote	Melissa Hensen
Deena Maniscalchi	Maryellen Hammond
Judy Lafleche	
\square by hand delivery on	by certified mail, return receipt requested, on
Date	Date

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act

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(M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

G. Recording Information

This Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

WEST SPRINGFIELD

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To.

WEST SPRINGFIELD

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

PIPER ROAD Project Location

Has been recorded at the Registry of Deeds of:

County

for:

Property Owner JAMES CZACH

and has been noted in the chain of title of the affected property in:

Book

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Page

Page

330-0371

MassDEP File Number

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Signature of Applicant

Rev. 4/1/2010

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Findings: The Conservation Commission does not confirm the delineated wetland line for use in any future project. The delineated lines received cursory review by the Conservation Commission to confirm the proposed project is a Buffer Zone only project. Most of the delineated wetlands are fragments of larger wetland areas that require a comprehensive view for those areas for permitting of any future projects. However, they are sufficiently delineated to establish the buffer area for this project.

20. Since the purpose of this review and Order of Conditions is to prevent, minimize and mitigate impacts upon the eight interests of the Wetlands Protection Act stated in 310 CMR 10, the applicant shall avoid any unauthorized impacts that will affect water quality, water supply and pollution prevention functions, storm damage prevention and flood control and wildlife habitat and fisheries protection. Therefore the applicant shall avoid site erosion, or any noticeable degradation of surface water quality discharging from the site. Any damage caused as a direct result of this project to any wetland resource areas shall be the responsibility of the applicant to repair or restore. Sediment reaching any resource area shall be considered fill of that wetland resource area. The applicant shall use Best Management Practices as outlined in "MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, A Guide for Planners, Designers and Municipal Officials", Original Print: March 1997 Reprint: May 2003 and Utilities Best Management Practices Manual prepared by Tighe & Bond for Northeast Utilities, 2007. This condition shall survive the expiration of this order and apply to all future owners of this or subdivided portions of this property. This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.

21. These Special Conditions do not supersede nor do they negate the requirements of the General Conditions on WPA form 5 Order of Conditions, 1-19. All successors and assigns in interest or control of the property subject to this Order of Conditions (hereinafter Order) and any contractor or other person performing work conditioned by this Order shall adhere to ALL applicable procedural and technical conditions in this Order. Property owners and applicants are responsible for adhering to this Order and representations made to the Conservation Commission in the process of obtaining this Order relative to how work will be performed. If the applicant or successors and assigns fails to follow this Order and approved documents; that action, may lead to enforcement proceedings by the Conservation Commission or other regulatory agencies.

22. Prior to start of construction, the applicant shall bring back to the Conservation Commission, final approved plans as reviewed by all other local boards, state and federal agencies, for Conservation Commission review and further conditioning if necessary. This condition does not prevent the applicant from moving forward with any work associated with environmental testing, investigation and remediation provided all devices to control erosion are in place.

23. Prior to the start of construction, the applicant shall submit a copy of the Stormwater Pollution Prevention Plan and NOI required by NPDES to the Conservation Commission for its records.

24. Prior to start of any work, and throughout the life of the project, the applicant shall designate and retain an Environmental Consultant/ Inspector. Such Inspector is subject to review and approval by the Commission. The Inspector shall make weekly reports during active site construction in the areas of jurisdictional concern, about the progress of the project and the condition of erosion control measures, by email to the West Springfield Conservation Commission and submit a final report signed by the Consultant/ Inspector, the Applicant and the Contractor. The Environmental Consultant/ Inspector shall directly and visually supervise on-site operations as necessary and oversee any emergency placement of controls and/or regulate inspection or replacement of erosion and sedimentation control devices. Said Environmental Consultant/ Inspector shall keep a weekly written log of compliance with the Order. Additional reports shall also be furnished to the Commission upon request of the Commission. This person shall be given full authority to:

- a. inspect all erosion control measures and current construction activities and oversee the cleaning and the proper disposal of waste products;
- b. Stop construction for erosion control purposes and improper implementation of the restoration plan.

25. With respect to all conditions the West Springfield Conservation Commission designates the Conservation Agent, as consultant to the Commission, as its agent with full powers to act on its behalf in administering and enforcing this Order. In case of emergencies, problems, or the need to discuss site conditions with the Conservation Commission, please contact the Commission at any time by calling (413) 263-3072 or calling Conservation Agent's cell number (413) 348-9462.

26. The term "Applicant" as used in the Order of Conditions (the "Order"), shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and the Order. The Order shall apply to all successors in interest and successors in control. *This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.*

27. The term "Plans" as used in the Order shall refer to the Plans entitled <u>"Town of West Springfield, Department of Public Works, Birnie Avenue/ Piper Road Area Sewer Expansion Project, CWSRF – 4513", Prepared by MOTT MACDONALD., Signed and stamped by David G. Goncalves, P.E. & Dated October 11, 2019; List of Plan Sheets:</u>

<u>"Notice of Intent: Birnie Avenue/ Piper Road Area Sewer Expansion Project,</u> <u>Massachusetts Wetlands Protection Act 310 CMR 10.00, October 10, 2019, West</u> <u>Springfield Department of Public Works (Applicant)</u> prepared by MOTT MACDONALD, Received October 11, 2019, signed by James Czach, Applicant and David G. Goncalves, Representative, 10/11/19.

28. The Order shall be included with all construction-related documents. All contractors working at the site shall be made aware of the provisions contained within the Order and adhere to all Conditions herein. At all times, the site foreman, supervising engineer or construction manager shall have a copy of the Order at the site and direct compliance with the requirements of the Order.

29. Prior to the start of any work, the applicant shall submit to the Commission a receipt from the Town Clerk of the complete recording of this Order along with all its special conditions.

30. Prior to the start of any work, the applicant and/or property owner shall submit a letter to the Commission stating that he/she has received, read, understands and shall comply with this Order.

31. Prior to the start of any work, the contractor, site foreman and/or construction manager and persons employed to perform earth moving activity shall submit a letter of understanding to the Commission stating that they have received, read, understand and shall comply with this Order.

32. Prior to start of any work, the Conservation Commission shall be notified by e-mail or other written form at least 48 hours prior to commencement of the work. Prior to this notice, the applicant shall have installed all erosion and sedimentation control devices as depicted on the plan on sheets C506 and C507, except in the case where the contractor will use alternative or similar devices, this shall require approval of the Conservation Agent prior to their use. All other changes must be agreed to by the Conservation Commission or its Agent, so they may be inspected, prior to start of work or pre-construction meeting. In addition, the applicant shall submit to the Conservation Commission a construction sequence plan prior to the pre-construction meeting.

33. Prior to start of any work, emergency contact phone numbers, including cell phone numbers of the applicant, their environmental consultant, contractor, and site foreman and construction manager shall be furnished to the Commission.

34. Prior to start of any work, a preconstruction conference shall be held between the Applicant, Property Owner, Contractor hired to do any site work, the

applicant's Environmental Consultant, a representative of the Conservation Commission and other Town departments as may be necessary.

35. Should the applicant, property owner, environmental consultant, or contractor have knowledge of or become aware of the occurrence or presence of any condition or event that would constitute a violation of the Wetlands Protection Act, its regulations or of these conditions, that person shall inform the Conservation Commission of such condition or event prior to any remediation effort or actions. *This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.*

36. Any material placed in any resource area without specific authorization under the Order shall be removed immediately upon demand of the Conservation Commission, its agent or the onsite Environmental Consultant. Activities prohibited within any resource area or its buffer zone except as authorized in the approved plans:

- operation of equipment, storage of materials, stockpiling of soil, or other site disturbance;
- stockpiling of debris, aggregate, fill, excavated material, construction material and building material; it shall also be stockpiled far enough away to prevent sediment from entering any wetland resource area;
- burying or disposal of debris or any other materials, other than that fill which may be allowed by the Order and as shown on the approved Plans herein;
- underground storage of fuel or other hazardous substances;
- dumping of leaves, grass clippings, brush, stumps, construction and yard debris or materials of any kind, unless expressly permitted by the Order or the Plans approved herein;
- refueling, servicing, and repair of motorized construction vehicles. Equipment operators shall be prepared to immediately respond to accidental releases of fuel, motor oil, and other liquids through containment. If any release of fuel, motor oil, lubricating oils, etc. occurs, the applicant and other responsible parties, in addition to all obligations under GL c. 21E (Massachusetts Oil and Hazardous Material Release Prevention and Response Act) and the Massachusetts Contingency Plan (MCP), shall immediately notify the Department of Environmental Protection's Western Regional Office at 1-413-784-1100. Any response action or cleanup shall be conducted pursuant to GL c. 21E and the MCP.

This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.

37. In accordance with Federal and State Stormwater requirements, all project sites shall incorporate trap rock at all construction entrances and shall maintain either a 25 foot undisturbed buffer of vegetation or a sedimentation/silt fence barrier between the work site and any paved roads, or neighboring properties to prevent erosion and

sedimentation from being carried off site. Construction Phase Stormwater Pollution Plan.

38. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair or replace silt fences, straw bales, erosion control blankets, riprap, filter berms or other devices planned for use during construction.

39. During construction street sweeping shall occur as needed and shall continue after completion of the project and/or when requested by the Commission until such time as a Certificate of Compliance is issued for this project.

40. Siltsacks shall be used and maintained in any catch basin down gradient from where construction is taking place, except in cases where public safety is a concern in these cases an alternate method of protecting the basins shall be approved by the Conservation Agent prior to start of construction, in either case controls shall remain until the site is stable. Accumulated sediment in the Siltsacks shall be removed as it accumulates.

41. Dewatering activities shall be conducted as shown on the approved Plans, sheet C506 and shall be monitored daily to ensure that sediment-laden water is appropriately settled prior to discharge toward the wetland resource areas or storm drains. No discharge of water is allowed directly into an area subject to jurisdiction of the Wetlands Protection Act. If emergency dewatering requirements arise, the applicant shall submit a contingency plan to the Commission for approval, which provides for the pumped water to be contained in a settling basin, to reduce turbidity prior to discharge into a resource area.

42. There shall be no pumping of water directly from or to any wetland resource areas. *This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.*

43. Cement trucks shall not be washed out in any wetland resource area or buffer zone, or into any drainage system. Any deposit of cement or concrete products into a buffer zone or wetland resource area shall be immediately removed.

44. All exposed soils at the site for periods greater than Fourteen days shall be stabilized with erosion control blanket or netting, a covering of straw mulch, or other erosion control best management practice, to prevent erosion and sedimentation into wetland resource areas. Drainage ditches shall be hydro-seeded with a perennial grass mixture if exposed for more than 30 days. Any stabilization materials such as jute netting shall be firmly anchored to prevent them from being washed from slopes by rain

or flooding. Preference should be given to biodegradable materials. *This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.*

45. Removal and storing of any snow activities shall adhere to the Bureau of Resource Protection's *Snow Disposal Guidance* Guideline No. BWR G2015-01 document dated December 21, 2015. *This condition is ongoing and does not expire upon completion of this project or the issuance of a Certificate of Compliance.*

46. All plant materials planted as part of this Order of Conditions are required to survive and be maintained. If any mortality occurs prior to the issuance of a Certificate of Compliance the applicant shall be required to replace the material with quantities, sizes and quality equal to or greater than that which were proposed at the time of the original permitting.

47. Site grading and construction shall be scheduled to avoid periods of heavy rainfall and periods of high surface water. Erosion controls shall be inspected after every rainfall to assure that maximum control has been provided.

48. Upon completion of construction final soil stabilization and one full growing season of growth of plant material, the applicant shall submit the following to the Conservation Commission to request a Certificate of Compliance (COC):

- A Completed Request for a Certificate of Compliance (WPA Form 8A).
- As-Built plans signed and stamped by a registered professional engineer or Landscape Architect, and a written statement from such professional certifying substantial compliance with the Plans and describing what deviation, if any, exists from the Plans approved in the Order. This plan shall include at a minimum:
 - All wetland resource area boundaries with associated buffer zones and regulatory setback areas taken from the plan(s) approved in the Order;
 - Locations and elevations of all stormwater management conveyances, structures and best management designs, including foundation drains, constructed under the Order that fall within or are conveyed to any wetland resource area or buffer zone;
 - Distances from any structures constructed under the Order to wetland resource areas "structures" include, but are not limited to, all buildings, septic system components, Stormwater basins, wells, utility lines, fences, retaining walls, and roads/driveways;
 - A line delineating the limit of work "work" includes any filling, excavating and/or disturbance of soils or vegetation approved under the Order.

49. The following conditions will remain in force in perpetuity and not extinguished by the issuance of a Certificate of Compliance: **SC 20**, **SC 26**, **SC 35**, **SC 36**, **SC 42**, **SC 44**, **SC 45**, **and SC 49**.

SECTION 01110 SUMMARY OF WORK

PART 1: GENERAL

1.01 <u>SUMMARY</u>

Contractor shall furnish all labor, materials (except as herein noted), equipment and means to provide the Work as described in the Contract Documents. The Work includes, but is not limited to, the following major items:

- a. Pavement removal, including saw cutting, as required.
- b. Providing approximately 17,500 linear feet of 8-inch and 10-inch PVC gravity sewer mains, 2,200 linear feet of 3-inch HDPE sewer force mains, 1,300 linear feet of 2-inch PVC low-pressure sewer, sanitary manholes, two pump stations, including electrical and structural work, and other related appurtenant work.
- c. Preparation of laydown area.
- d. All permits or licenses required for the Contractor's operations or required elsewhere in the Contract Documents, including the National Pollution Discharge Elimination System (NPDES) Stormwater Permit.
- e. Rearranging storm sewer, water main and other pipes where necessary.
- f. Sanitary branch connections and service laterals.
- g. Furnishing of traffic warning and control as required.
- h. Sheeting, bracing and support of trench and adjoining ground where necessary.
- i. Dewatering, handling drainage and water removal.
- j. Protecting the site and materials on site.
- k. Excavation and backfilling of trenches and pits.
- 1. Restoration of paved, concrete and gravel surfaces, and curbing.
- m. Erosion and sediment control.
- n. Removal and disposal of surplus excavated material and debris, and cleaning of the work site.
- o. Maintenance and cleaning of streets, project work areas or other surfaces for the required period of time.
- p. Ground restoration.
- q. Piping tie-ins.

- r. Performance of low-pressure air, hydrostatic pressure and leakage tests; vertical deflection tests; and CCTV inspections.
- s. Flushing and cleaning of installed piping.
- t. Submit as-built records.

The above general outline of principal features does not in any way limit the responsibility of the Contractor to perform all Work and furnish the required materials, equipment, labor and means as shown or required by the Contract Documents.

Materials, equipment, labor, etc., obviously a part of the Work and necessary for the proper operation and installation of same, although not specifically indicated in the Contract Documents, shall be provided as if called for in detail without additional cost to the Owner.

1.02 WORK BY OWNER

Owner will perform certain items of Work related to this project as follows:

- a. Operate all valves necessary to shut-off, flush and reactivate its pipeline.
- b. Mark locations of existing water services, valves, mains, etc.
- c. Other work, if any, as described in the Supplementary Conditions.

1.03 MATERIALS FURNISHED BY OWNER

a. The Owner will not furnish any materials.

1.04 LOCATIONS

- a. Work is to be performed on Owner's property or rights-of-ways and easements obtained by the Owner or within public right-of-way and easements. Work shall be performed by the Contractor within these limits.
- b. It is the obligation and responsibility of the Contractor to determine the exact limitations of the rights-of-way and/or easements and any conditions limiting or affecting the use thereof by the Owner and/or the Contractor. The Contractor agrees to indemnify and hold harmless the Owner against any claims made by any property Owner, including, without limiting the generality hereof, any claim that the Contractor has failed to keep his work, equipment, materials, or workmen within the limits authorized by the right-of-way and/or easement or any claim that the Contractor has failed to comply with any condition or requirement, or agreement respecting the right-of-way and/or easement.
- c. Some of the locations shown or described in the Contract Documents, such as tie-ins, are approximate and the Contractor shall be responsible for locating the exact locations.

PART 2: <u>PRODUCTS</u>

a. Specifications for the materials and equipment to be provided by the Contractor are detailed in the respective Specification Sections.

PART 3: EXECUTION

3.01 FIELD SURVEY WORK

a. Owner will provide reference points and Contractor will be responsible for the laying out of the Work.

3.02 <u>COORDINATION</u>

- a. Contractor will be required to coordinate his work, to phase the construction operations, and provide, install and maintain any temporary connections necessary to prevent interference to operation of Owner's facilities.
- b. Any construction work requiring the shutdown of facilities must be scheduled and performed only at such times as shall be authorized by the Owner. Such Work must be completed during the specific periods authorized by the Owner.

3.03 <u>REGULATORY REQUIREMENTS</u>

a. When the Work is to be done in a public right-of-way and a state, county, or municipal inspector is assigned to the Project during the construction of the Work, the Contractor will arrange for an inspector with the Owner paying all costs in connection with the inspector.

3.04 <u>MILESTONES</u>

- a. Work shall commence upon the issuance of a Notice to Proceed. The Contractor shall begin construction no later than June 30, 2020, and will be expected to make steady progress towards completion of the Contract within the Contract Times. To this end, the Contractor will be expected to make the following minimum progress towards completion of the Work:
 - 1. <u>October 31, 2020:</u> Substantial completion of Valley View Circle Sewershed Work, excluding Valley View Circle Pump Station Work.
 - 2. June 30, 2021: Substantial completion of all other Work.
 - 3. July 31, 2021: Final completion.

3.05 <u>CONSTRUCTION SEQUENCE</u>

- a. Construction schedules shall be submitted in accordance with Section 01330, Submittal Procedures. The schedule shall include a proposed construction sequence.
- b. The Work shall generally be performed in a sequence to achieve the milestones indicated in Paragraph 3.04.a of this Section. The Valley View Circle Sewershed encompasses of the following streets:

- 1. Valley View Circle
- 2. Woodbrook Terrace
- 3. Hemlock Hill Road
- 4. Sweetfern Drive

END OF SECTION

SECTION 01270 MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 <u>SCOPE</u>

Work to be performed under this Contract shall be paid for in accordance with the "Base Bid Price Schedule" of the bid. The cost of labor, equipment, materials or work called for in the Specification, shown on the Drawings, or necessary for a complete and satisfactory installation, but which are not specifically mentioned in this Section shall be included in the appropriate pay item by the CONTRACTOR at no additional expense to the OWNER.

Division 2 through Division 16 Work will be measured and paid for at the Contractor's unit Bid price or lump sum item cost as indicated on the Bid form. Those payable Work items, and related prices as Bid, will be the basis for all compensation to the Contractor for Work performed under this Contract. Work not specifically included as a Bid item, but which is required to properly and satisfactorily complete the Work is considered ancillary and incidental to the Bid item Work, and payment for such Work is considered to be included in the values as Bid for payable items. Compensation for all unit Bid price Work will be made based on the measured quantity of Work under the appropriate Bid items.

1.02 PAYMENT ITEMS

The prices shown in the "Schedule of Prices" of the Bid include all costs to construct the work under this Contract.

ITEM 1 For Mobilization and Demobilization of Equipment, Materials, and Labor.

Mobilization and demobilization to the Site will not be measured. Payment will be made at the contract lump sum price. Mobilization costs are the costs of initiating the contract, exclusive of the cost of materials. Payment for mobilization shall be a lump sum at the price bid for this item and shall be payable at the time of the first payment request after the contractor is operational on the site. Payment of the lump sum price will be paid in two equal installments. Payment for the second installment will be included in the first payment request after Final Completion has been reached and all equipment has been removed from the site.

The lump sum price bid for this item shall not exceed five (5) percent of the total bid price.

ITEM 2 Excavation and Disposal

The unit prices for excavation shall include additional price for rock excavation; disposal of contaminated; disposal of clean unsuitable soil; storage in temporary spoil banks; furnishing, placing, and removal of sheeting and shoring; removal of water from the excavation; cleaning up of the site; and any additional work as may be required to complete all excavation and disposal for pipe and structures.

Excavation will be measured for payment under the various subdivisions of Item 2, on the following basis:

01270-1

Item 2a - Rock:

Rock removal shall be measured by cubic yard removed as measured in accordance with the below:

The pay limit for rock removal outside proposed manholes shall commence one foot (1') outside the widest dimension of the structure or shall be the maximum connecting trench width, whichever is greater.

Payment depth for rock which is encountered in a trench shall be no less than three feet (3') when removal can be accomplished only by drilling and blasting or by use of jack (air or hydraulic) hammers.

Payment for rock removed, using the same or equal equipment as utilized for normal trench excavation, shall be limited to the actual depth removed within the limits established by the contract documents.

Boulders encountered within the pay limits of excavation, whose volume is one cubic yard or greater, part of which extends outside said limits shall be paid in accordance with the actual volume excavated.

Where pay lines for structures and trenches overlap, the excavation within such overlapping lines will be measured only once or where trenches intersect and pay lines overlap, the excavation within such overlapping lines will be measured only once.

The unit price under the various subsections of Item 2 (Items 2a, 2b & 2c) shall include all costs associated with the stockpiling, sampling, laboratory analysis, transportation and disposal of rock, contaminated and clean soil.

Disposal of Contaminated and Clean Unsuitable Soil:

Measurement for payment under Items 2b and 2c shall be based on the tonnage indicated on the weight tickets as received from the disposal location. Records will be kept of all trucks leaving the site with contaminated soil. The weight tickets will be compared to a weight estimate based on the volume of material in the truck and a standard density applied to convert from cubic yards to tons. In the event the selected disposal location does not have a scale facility, an average truck weight will be established prior to the trucks leaving the project site. In no case will the average weight be more than the allowable legal limit of the truck. The Engineer must be present at the site for the logging of all trucks leaving the site. Waste classification costs and laboratory analyses shall be included under the various unit price items under Item 2.

The following is a summary of items 2b and 2c:

Item 2b – Stockpiling, Analysis, Transportation and Disposal of Excavated Contaminated Soil as defined under Section 02120 and 02315.

Item 2c – Stockpiling, Analysis, Transportation and Disposal of Excavated Soil classified as Clean Soil under Section 02120 and 02315.

Excavated soil under this Specification Item shall be handled and paid for under and in accordance with Item 6 of these Specifications.

All excavation and backfill will be measured and paid for under the following subdivisions of Item 6, and all pertinent stipulations under Item 6 shall apply to all subdivisions.

Rock Excavation - Work Included and Payment

Where material excavated under Item 6 is rock, AN ADDITIONAL OR EXCESS PRICE per cubic yard will be paid for under Item 2a.

Rock excavation will be measured for payment in accordance with this section.

For such purposes, "rock" shall mean igneous, sedimentary, metamorphic, and conglomerate rock, which for excavation must be drilled, blasted, broken, or ripped by power tools. Boulders and concrete structures one cubic yard or greater, however removed, are included within this definition of rock for payment purposes.

All work shall be in conformance with Specification Sections 02240, 02315, 02320, and 02370.

ITEM 3 For Existing Utility Investigations

Item 3a - Test Pits

Measurement for payment under this Item shall be computed based on dimensions of test pits as ordered by the Engineer and as measured in the field.

Payment shall be made on a per cubic yard basis and shall include all labor, saw cutting of pavement, excavating, dewatering, sheeting/bracing, backfilling, including with select backfill material, and compacting as necessary for test pits. Any pavement resurfacing associated with test pitting is to be paid separately under Item 16. Work shall be completed in conformance with Specification Section 02215.

Item 3b - Ground Penetrating Radar

Measurement for payment under this Item shall be computed based on length, in linear feet, of ground penetrating radar as ordered by the Engineer and as measured in the field.

Payment shall be made on a linear foot basis, assuming full right-of-way widths on a perpendicular basis from the pipe, and shall include all labor and investigations as necessary for the work. Work shall be completed in conformance with Specification Section 02210.

ITEM 4 Clearing and Grubbing

Measurement for payment under this item shall be computed based on horizontal plane area and will be the number of acres within the limiting stations of the project and/or as designated by the Engineer and the outside limits of measurement shall extend to a point 5 feet beyond the top or bottoms of slopes, excluding existing roadway and shoulder surfaces, streams or bodies of water.

Measurement of selective clearing and thinning will be based on the actual number of acres which receive the required attention. Approximate locations will be shown on the plans or detail sheets and as designated in the field by the Engineer.

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Clearing and grubbing will be paid for at the Contract unit price per acre.

All work for Item 4 shall be completed in conformance with Specification Section 02230.

ITEM 5 For Soil Erosion and Sediment Control

Item 5a Straw Wattles

The unit prices bid per linear foot under this item shall include all labor, materials and equipment required for straw wattles. Field conditions shall dictate the amount of control measures which will be required. The Contractor shall familiarize himself with the project site, so that he may accurately determine the extent of controls which will be required. Payment for all excavations and/or fills required under this Item and the backfill and/or leveling of same shall be included under this Item.

Payment for this Item will be based on the actual length of straw wattles ordered and used in the work as measured in place. Payment for this item shall be made at fifty percent (50%) during the course of the work provided the soil erosion and sediment control measures have been properly implemented and fifty percent (50%) upon final restoration of the project site and removal of soil erosion and sediment control measures.

Item 5b Inlet Protection

The unit prices bid per unit under this item shall include all labor, maintenance, materials and equipment required for inlet protection as shown on the Contract Drawings or directed by the ENGINEER.

Payment for this Item will be based on a count of the actual amount of inlet protection used in the work as measured in place. Payment for this item shall be made at fifty percent (50%) during the course of the work provided the soil erosion and sediment control measures have been properly implemented and fifty percent (50%) upon final restoration of the project site and removal of soil erosion and sediment control measures.

All work for Item 5 shall be completed in conformance with Specification Section 02370.

<u>ITEM 6</u> For Furnishing, Laying, Jointing, and Testing Sanitary Sewer Pipe including Valves, and Fittings. (Including Pavement Removal, Excavation and Backfill)

For the unit prices bid per linear foot under the subdivisions of this item, the Contractor shall furnish, lay and, joint, PVC sanitary sewer pipe of the diameters shown in the proposal. The work under this item shall be in accordance with the applicable sections of the Contract Specifications.

The work shall include all excavation, pavement removal, backfill and backfill compaction with excavated material, bypass pumping, sheeting, bracing and dewatering, and additional work as may be noted on the Contract Drawings or specified herein.

Depth of trench shall be measured from the actual ground elevation to the pipe invert, exclusive of excavation required for six (6) inches of bedding material. Excavation for the sewer pipe bedding material, installation of filter fabric and placement of stone bedding from six (6) inches over the crown of the pipe to a depth twelve (12) inches below pipe invert is included in the unit price bid for this item. Furnishing, placing, and compacting stone bedding material at a depth beyond 12 inches below the pipe invert due to soil conditions deemed poor by the Engineer shall be paid for under Item 15. Furnishing, placing and compacting imported backfill material, where directed by the Engineer due to poor soil conditions, shall be paid under Items 15.

Payment for furnishing, laying, jointing, and testing of PVC Sewer Pipe shall be made at the unit price per linear foot under the respective subdivisions of Item 6. Payment for this Item will be based on the actual length of PVC sewer pipe ordered and used in the work as measured in place. No payment shall be made for the distance between inside faces of the manhole, nor shall payment be made for straight through manholes where pipe is used for the invert of the manhole.

The prices bid shall include excavation for the construction of the sewer, including excavation for the sewer main foundation material, as shown on the Contract Drawings, or as required by the ENGINEER.

The prices bid shall include storage in temporary spoil banks of material suitable, allowed, and approved for use as backfill. The prices bid shall also include drying and handling of the native excavated material to enable the material to be suitable for use as backfill.

The prices bid shall also include furnishing, placing, and removal of any sheeting required, the draining and pumping of all excavations, the protection of existing utilities and structures, and the cleaning up of the site.

The prices bid shall also include stripping, storage, and replacement of topsoil, any clearing, tree removal, removal of debris, and cutting pavements neatly, prior to excavation. All clearing and grubbing within the wooded right-of-way will be paid for under a separate bid item. Trees removed that have a shortest diameter greater than 9-inches shall be paid for Under Item 18.

The prices bid shall also include the protection of existing utilities and structures.

The prices bid under various sub-sections of Item 6 shall include the necessary labor, equipment, material and related work for the temporary disconnection and reconnection of existing sanitary, water and gas services as required for the construction of the sanitary sewer. All utility services must be restored as soon as possible. The Contractor must coordinate the interruption of utility service, if necessary, with the Owner of the utility and property owner. No additional payments will be made for this work.

The prices bid under the various sub-sections of Item 6 shall include all necessary labor, equipment, materials and costs necessary to maintain sewage flow in sewers being replaced or modified. Bypass pumping may be required to maintain sewage flows and shall be included under this Item. The Contractor shall submit written plan to the Engineer for review and acceptance detailing how sewage flows will be maintained.

The removal of pavement, curbing, sidewalks and other surface improvements in conformity with Town shall be done under this item with such work included in the unit prices bid for Item 16. Replacement or restoration shall be done in accordance with applicable provisions of this Specification and in conformity with the requirements of the Town; all work to be done to the satisfaction of the Engineer.

All pavement replacement, including sub-base material, stabilized base course and surface course overlay, shall be included in the unit prices bid for Item 16. All surface restoration work identified on the Drawings, including curb replacement, sidewalk replacement, guide rail replacement, driveway replacement, seeding, mulching, etc. shall be included under the unit prices bid under their respective bid items.

No payment will be made for repair of damage to sidewalks, curbing, or site improvements caused by the careless operation of the Contractor.

507408636-002 February 2020 Any damage to portions of pavement outside the limits of the trench width, which in the opinion of the Engineer, has been caused by negligence of the Contractor, his workmen or agents, shall be repaired in a manner satisfactory to the Engineer and the Town, by and at the expense of the Contractor.

Connections and modifications to existing manholes, including coring, sealing or modifying existing pipe penetrations, shall be included as part of the unit price bid for the applicable subdivisions of this item. No separate payment will be made for modifications to existing structures which are required to connect sanitary lines at new elevations.

Testing shall be performed in accordance with the applicable sections of the Specifications, and shall be included as part of the unit price bid for the applicable sub-divisions of this item.

Payment under this item will be based on actual length of pipe used in the work as measured in place for various depths of cut. Measurement will be along the ground surface above and parallel to the pipeline from and to the inside face of structures.

No payment shall be made for the distance between the inside faces of the manhole, nor shall payment be made for straight through manholes where pipe is used for the invert of the manhole.

Upon complete installation of the sewer line and appurtenances, including excavation and backfill, payment for installed pipe will be ninety percent (90%) of the unit price bid.

Upon successful mandrel testing (PVC pipe), TV inspection, and (where practical, air testing) and flushing of the installed sewer lines an additional ten percent (10%) of the unit price bid shall be paid.

All work shall be completed in conformance with Specification Sections 15070, 15100, 15200, and 15990.

ITEM 7 For Sanitary Service Laterals

Measurement and Payment for 6-inch Diameter PVC house Connections Item 7a (Including Excavation and Backfill)

Payment for PVC gravity sewer house connections shall be based upon the actual length of pipe furnished and installed in place as ordered by the Engineer including mainline tee wye, fittings, cleanout, and cast iron clean-out box frames and covers. Payment for laterals shall be based upon the centerline length of pipe and fittings as measured in place. No additional payment will be made for the work of excavation, pavement removal, backfill and backfill compaction with excavated material, bypass pumping, sheeting, bracing and dewatering, and additional work as may be noted on the Contract Drawings or specified herein, or for reducing fittings utilized in construction of house connections and cleanouts other than the unit prices bid per lineal foot under Items 7a. Payment for crushed stone pipe foundation and pipe bedding shall be included in Item 7a. Concrete utilized in construction of cleanouts will be paid for under Item 9. Payment for rock excavation, testing of pipe, bank run sand, surface restoration and pavement replacement, shall be made under other items.

The work shall be completed in conformance with Specification Sections 15070, 15080, and 15990.

Measurement and Payment for Sewer Service Chimneys Item 7b (Including Excavation and Backfill)

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For the unit prices bid under Item 7b, as indicated on the plans and where directed by the Engineer, the Contractor shall install sewer service chimneys. Payment for Sewer Service Chimneys shall be based on the unit price bid for each vertical riser actually installed complete in place. Payment for pavement removal shall be included in Item 7a. Payment for rock excavation, testing of pipe, bank run sand, surface restoration and pavement replacement, shall be made under other items.

The work shall be completed in conformance with Specification Sections 15070, 15080, and 15990.

Measurement and Payment for 1-1/2-inch Diameter SDR-21 PVC Pipe Pressure House Connections Item 7c

Payment for PVC pressure sewer house connections shall be based upon the actual length of pipe furnished and installed in place as ordered by the Engineer including mainline tee wye, fittings, cleanout, and cast iron clean-out box frames and covers. No additional payment will be made for the work of excavation, pavement removal, backfill and backfill compaction with excavated material, bypass pumping, sheeting, bracing and dewatering, and additional work as may be noted on the Contract Drawings or specified herein, utilized in construction of pressure house connections other than the unit prices bid per lineal foot under Item 7c. Payment for crushed stone pipe foundation and pipe bedding shall be included in the unit prices bid per lineal foot under Items 7c. Concrete used shall be paid for under Item 9. Payment for rock excavation, testing of pipe, quarry process stone, surface restoration and pavement replacement, shall be made under other appropriate items.

The work shall be completed in conformance with Specification Sections 15070 and 15990.

ITEM 8 Reconnecting Existing Service Laterals

The Contractor shall be paid for each lateral reconnection ordered installed by the Engineer based on the unit prices bid for this item subdivisions. Branch connections shall be measured based on the reconnection installed. Excavation shall be paid for under Item 2. The concrete required to support and encase the connection as directed in the field shall be paid for under Item 9.

All work shall be completed in conformance with Specification Sections 15080 and 15990.

ITEM 9 For Furnishing and Placing Concrete For Pipelines (including forms)

Concrete to be paid for will be the cubic yard quantity as computed from net sections specified, or ordered by the Engineer, or as shown on the plans, or as altered during construction by the Engineer. No credit will be given for wastage or extra concrete placed through error of the Contractor. Volumes will be computed from the measurements of the members as noted on the plans subject to such modification as the Engineer may make in the structures after construction has started. Voids in concrete slabs or walls for pipe, manhole frames and similar voids will not be measured for payment. The Contractor shall be paid based on the cubic yard price bid for this item.

All concrete shall be in conformance with Specification Section 03005.

ITEM 10 For Removal and Disposal of Existing Sanitary Sewer Pipe

Payment for this item shall be per lineal foot of existing sewer line that is physically removed and properly disposed of during excavation for the proposed sewer. The unit price shall include all labor materials, and equipment necessary for complete removal and proper disposal of existing sewer pipe, all sizes.

ITEM 11 For Constructing New Sanitary Manholes (Including Excavation and Backfill)

Measurement for payment shall be from the top of the manhole frame to the invert of the lowest sewer in the manhole.

Payment under this item shall be per unit for each complete and finished standard manhole under the appropriate subdivisions of this item. Complete and finished manhole work includes but is not limited to excavation and backfill, pavement removal, shoring, dewatering, manhole frames and covers, vitrified brick leveling courses, bedding frames in mortar, base sections, top sections (cone or flat slab), riser sections, benching, epoxy paint, drop connections including concrete, and polypropylene manhole steps, 3/4" stone with filter fabric underlayment, testing, interior pipe, fittings, and valves. Payment for pavement replacement shall be included under separate items.

Measurement and Payment for Removing and Disposing Existing Manholes (For All Depths)

Payment under this item shall be per unit for each manhole removed. Removal of manholes includes but is not limited to manhole removal and disposal. Payment for excavation, bank run sand and pavement replacement shall be included under separate items.

All work under Item 11 shall be completed in conformance with Sections 02530 and 03400.

ITEM 12 For Furnishing, Laying and Jointing Storm Sewer Pipe (Including Excavation and Backfill)

Item 12a For Reinforced Concrete Pipe

Storm sewer pipe will be measured on a linear foot basis for each pipe size, class, and pipe type installed. Measurement will be made along the ground surface above and parallel to the pipeline from and to the inside face of structures. The work under this item shall be in accordance with the applicable sections of the Contract Specifications.

Payment will be made for the quantity as above determined, measured per linear foot, at the price bid per linear foot for this item, which shall include the cost of all pavement removal, excavation, dewatering, backfill, compaction, materials, stone bedding, installation of new storm sewer pipe, connection proposed and/or existing structures, relaying of existing utilities, labor, equipment, and all else necessary therefore and incidental thereto. Payment for pavement replacement shall be included under separate items.

Depth of trench shall be measured from the actual ground elevation to the pipe invert, exclusive of excavation required for six (6) inches of bedding material. Excavation for the pipe bedding material, installation of filter fabric and placement of stone bedding from six (6) inches over the crown of the pipe to a depth twelve (12) inches below pipe invert is included in the unit price bid for this item. Furnishing, placing, and compacting stone bedding material at a depth beyond 12-inches below the pipe invert due to soil conditions deemed poor by the Engineer shall be paid for under Item 15. Furnishing, placing and compacting imported backfill material, where directed by the Engineer due to poor soil conditions, shall be paid under Items 15.

Payment for furnishing, laying, and jointing of Storm Sewer Pipe shall be made at the unit price per linear foot under the respective subdivisions of Item 12. Payment for this Item will be based on the actual length of storm sewer pipe ordered and used in the work as measured in place. No payment shall be made for the distance between inside faces of the manhole.

The prices bid shall include excavation for the construction of the sewer, including excavation for the storm sewer main foundation material, as shown on the Contract Drawings, or as required by the ENGINEER.

The prices bid shall include storage in temporary spoil banks of material suitable, allowed, and approved for use as backfill. The prices bid shall also include drying and handling of the native excavated material to enable the material to be suitable for use as backfill.

The prices bid shall also include furnishing, placing, and removal of any sheeting required, the draining and pumping of all excavations, the protection of existing utilities and structures, and the cleaning up of the site.

The prices bid shall also include stripping, storage, and replacement of topsoil, any clearing, tree removal, removal of debris, and cutting pavements neatly, prior to excavation.

The prices bid shall also include the protection of existing utilities and structures.

The prices bid under various sub-sections of Item 12 shall include the necessary labor, equipment, material and related work for the temporary disconnection and reconnection of existing sanitary, water and gas services as required for the construction of the sanitary sewer. All utility services must be restored as soon as possible. The Contractor must coordinate the interruption of utility service, if necessary, with the Owner of the utility and property owner. No additional payments will be made for this work.

The removal of pavement, curbing, sidewalks and other surface improvements in conformity with Town shall be done under this item with such work included in the unit prices bid for Item 16. Replacement or restoration shall be done in accordance with applicable provisions of this Specification and in conformity with the requirements of the Town; all work to be done to the satisfaction of the Engineer.

All pavement replacement, including sub-base material, stabilized base course and surface course overlay, shall be included in the unit prices bid for Item 16. All surface restoration work identified on the Drawings, including curb replacement, sidewalk replacement, guide rail replacement, driveway replacement, seeding, mulching, etc. shall be included under the unit prices bid under their respective bid items.

No payment will be made for repair of damage to sidewalks, curbing, or site improvements caused by the careless operation of the Contractor.

Any damage to portions of pavement outside the limits of the trench width, which in the opinion of the Engineer, has been caused by negligence of the Contractor, his workmen or agents, shall be repaired in a manner satisfactory to the Engineer and the Town, by and at the expense of the Contractor.

Connections and modifications to existing manholes, including coring, sealing or modifying existing pipe penetrations, shall be included as part of the unit price bid for the applicable subdivisions of this item. No

separate payment will be made for modifications to existing structures which are required to connect sanitary lines at new elevations.

Item 12b For Removal and Disposal of Reinforced Concrete Pipe

Storm sewer pipe removed and disposed will be measured on a linear foot basis for all pipe sizes.

Payment will be made for the quantity as above determined, measured per linear foot, at the price bid per linear foot for this item, which shall include the cost of all pavement removal, excavation, backfill, materials, construction of bulkhead within existing structures for sealing and abandoning existing connections, relaying of existing utilities, labor, equipment, and all else necessary therefore and incidental thereto. Payment for pavement replacement shall be included under separate items.

All work for Item 12 shall be completed in conformance with Specification Sections 03400 and 15200.

ITEM 13 For Constructing New Storm Manholes

Measurement for payment shall be from the top of the manhole frame to the invert of the lowest sewer in the manhole.

Payment under this item shall be a unit price per satisfactorily complete and finished manhole. Complete and finished manhole work includes but is not limited to excavation and backfill, pavement removal, shoring, dewatering, manhole frames and covers, vitrified brick leveling courses, bedding frames in mortar, base sections, top sections (cone or flat slab), riser sections, benching, and polypropylene manhole steps, 3/4" stone with filter fabric underlayment, interior pipe, and fittings. Payment for pavement replacement shall be included under separate items.

All costs for selective demolition and replacement of existing storm sewer pipe as required for installation and connection of storm sewer manholes shall also be included under the unit price bid for this item. At a minimum, the Contractor shall assume selective demolition and replacement of existing storm sewer pipe is required three (3) feet beyond the exterior face of the manhole. All costs for removal and disposal of existing storm sewer pipe and manholes shall be included under the unit price bid for this item.

All work for Item 13 shall be in conformance with Specification Section 03400 and 15200.

ITEM 14 For Constructing New Storm Inlets

Item 14a For Removing and Disposing of Existing Storm Inlets or Catch Basins

Payment for this item will be measured by the units removed and properly disposed of off-site.

Payment will be made for the quantity as above determined, measured per unit, at the price bid per unit for this item, which shall include the cost of all disconnection to existing storm sewer piping, relaying of existing utilities, labor, equipment, and all else necessary therefore and incidental thereto.

Item 14b For Constructing New 48" Storm Catch Basins

Payment for this item will be measured by the units installed.

Payment will be made for the quantity as above determined, measured per unit, at the price bid per unit for this item, which price shall include, but is not limited to excavation and backfill, pavement removal,

shoring, dewatering, frames and covers, vitrified brick leveling courses, bedding frames in mortar, base sections, top sections (cone or flat slab), sump, riser sections, 3/4" stone with filter fabric underlayment, hood, connection of proposed storm sewer piping to the storm catch basin, relaying of existing utilities, labor, equipment, and all else necessary therefore and incidental thereto. Payment for pavement replacement shall be included under separate items.

All work for Item 14 shall be in conformance with Specification Section 03400.

ITEM 15 For Furnishing and Placing Bank Run Sand Backfill

Measurement and payment for select material used as trench backfill will be made for the depths required and for a pay width as shown on the drawings plus the outside diameter of the pipe, less the volume of the pipe surrounded. No adjustment to the pay width to compensate for any differences between the pay width and the actual trench width resulting from excavation and trench shoring methods used by the Contractor. The Contractor's unit price submitted for this item shall reflect the above stipulated method for measurement and payment.

All quantities of select backfill will be paid for at the price bid per cubic yard. The unit price paid per cubic yard under this item shall be compensation in full for furnishing, handling, placing, grading, and compacting of select fill in all areas as outlined previously. No adjustment will be made to the pay width to compensate for any differences between the actual trench width and the pay width resulting from the excavation and trench shoring methods used by the Contractor. The Contractor's unit price submitted for this item shall reflect the above stipulated method for measurement and payment.

Payment for the road subgrade shall be included under Item 16 and not under Item 15. The unit price bid per square yard for Temporary Pavement Replacement shall include the dense graded aggregate (DGA) used for road subgrade and shall be compensation in full for furnishing and installing such material including excavation and disposal of existing material in areas where DGA subgrade is to be placed as shown on the Drawings and ordered by the Engineer. The unit price shall also include compaction of DGA subgrade.

All work for Item 15 shall be in conformance with Specification Sections 02315 and 02320.

ITEM 16 For Bituminous Pavement

Under Item 16a Temporary Asphalt Pavement Replacement Trench Repairs, payment for stabilized base bituminous pavement replacement shall be based upon the total square yards for the actual width of the area to be restored (up to a maximum pay width) for the length between stations over which temporary pavement is ordered. No additional payment will be made for overlapping trenches at intersecting pipes. Payment for service connection runouts shall be made from the edge of main trench to the edge of pavement. No payment will be made for repair of damage to existing pavement caused by the careless operation of the Contractor. The unit price bid under 16a shall include materials, equipment, sub-base, compaction, saw-cutting, and labor to complete this work. The work shall include stabilizing unstable base conditions within the trench pay limits ahead of pavement placement due to poor excavation, backfill and compaction during the construction of pipe and structures. Payment shall include the removal and proper disposal of the existing bituminous pavement road replaced.

Under Item 16b Access Driveway Pavement for stabilized base bituminous pavement, payment shall be based upon the total square yards for the actual width of the area to be restored for the length of the access

driveway over which temporary pavement is ordered. The unit price bid under 16b shall include materials, equipment, sub-base, compaction, saw-cutting, and labor to complete this work.

Under Item 16c For Asphalt Pavement Sidewalk Replacement, payment shall be based upon the total square yards for the actual width of the area to be restored for the length of sidewalk over which bituminous pavement sidewalk is ordered. No payment will be made for repair of damage to existing sidewalk caused by the careless operation of the Contractor. The unit price bid under 16c shall include materials, equipment, sub-base, compaction, saw-cutting, and labor to complete this work. Payment shall include the removal and proper disposal of the existing bituminous pavement sidewalk replaced.

Under 16d For Asphalt Pavement Curb Replacement, payment shall be based upon the total linear foot curb replaced as ordered to complete the work. Curb replaced shall be as measured from the inside face of curb installed. The unit price bid under 16d shall include all materials, equipment, sub-base, compaction, saw-cutting, and labor to complete this work. Payment shall include the removal and proper disposal of the existing bituminous pavement curb replaced.

Under 16e For Traffic Striping, measurement for pavement markings will be on a linear foot basis as measured in the field by the Engineer. The length of solid lines will be the actual length of the markings applied. The length of broken lines will be one quarter of the total length of road marked. Payment of the Bid price for 4 inch wide pavement markings will be full compensation for all labor, equipment, and materials required for or incidental to the Work, including providing both temporary markings, and permanent markings.

All work under Item 16 shall be in conformance with Specification Sections 02740 and 02770.

ITEM 17 For Concrete Sidewalk Replacement

Under Item 17 the Contractor shall be paid for the unit price bid per square yard for concrete sidewalk. No payment will be made for replacement of sidewalks damaged by the careless operation of the Contractor. The unit price bid under Item 17 shall include all concrete, expansion joint material, crushed stone, and forms required to complete the work. Payment shall include the removal and proper disposal of the existing sidewalk replaced.

All work under Item 17 shall be in conformance with Specification Section 02770.

ITEM 18 For Landscaping Replacement

Under Item 18a For Restoration of Unpaved Areas, measurement for restoration of unpaved areas will be on a square yard basis as measured in the field by the Engineer. The length of the repair will be the actual length of the trench loamed and seeded. Payment of the bid price for restoration of unpaved areas will be full compensation for all labor, equipment, and materials required for or incidental to the work.

Under Item 18b For Replacement of Landscape Shrub, measurement for the replacement of landscape shrubs will be based on the units replaced as measured in the field by the Engineer. Payment of the bid price for replacement of landscape shrub will be full compensation for all labor, equipment, and materials for or incidental to the work.

Under Item 18c For Replacement of Landscape Tree, measurement for the replacement of landscape trees will be based on the units replaced as measured in the field by the Engineer. Payment of the bid price for replacement of landscape tree will be full compensation for all labor, equipment, and materials for or incidental to the work.

All work under Item 18 shall be in conformance with Specification Section 02900.

ITEM 19 For Furnishing, Installing, and Testing 6-inch and 8-inch Diameter Ductile Iron Water Main

Measurement for the furnishing, installing, and testing of 6-inch and 8-inch diameter ductile iron water main shall be based on linear foot as measured in the field by the Engineer. The contract unit price shall include all materials, labor, equipment, fittings, valves, thrust blocks, restraints, and all as necessary to make a complete and satisfactory installation.

The work shall include all excavation, pavement removal, backfill and backfill compaction with excavated material, sheeting, bracing and dewatering, and additional work as may be noted on the Contract Drawings or specified herein.

All work under Item 19 shall be in conformance with Specification Sections 15001 and 15990.

ITEM 20 For Furnishing, Installing, and Testing Fire Hydrants

Payment will be made at the Contract Unit Price for each fire hydrant installation. The unit price shall include all costs to install any materials furnished and installed. The contract unit price will include furnishing and installing hydrant and valve, piping, wet-tap, tapping valve, valve box, reaction blocking, crushed stone, and all as necessary to make a complete and satisfactory installation.

The work shall include all excavation, pavement removal, backfill and backfill compaction with excavated material, sheeting, bracing and dewatering, and additional work as may be noted on the Contract Drawings or specified herein.

All work under Item 20 shall be in conformance with Specification Sections 15001 and 15100.

ITEM 21 For the Piper/Apricot Pump Station Complete and Operational

For the lump sum price bid, the Contractor shall furnish all labor, equipment, material and such additional work as may be required for constructing the Piper/Apricot Pump Station, involving the construction of new wet well, pumps, valve chamber, vents, fencing, generators, bollards, concrete pads, foundations, structures, access roads including storm drainage and headwalls, laydown area, and all other work necessary to form a completed facility as shown on the Drawings and specified herein. The lump sum price shall generally include all work shown on Contract Drawings, with the exception of influent buried gravity sewer piping to the wet well and buried force main piping from the valve chamber. All clearing/grubbing, tree removal and site preparation shall be included in the lump sum bid price.

The work shall include all excavation, disposal of excess materials, backfill and backfill compaction with excavated material, sheeting, bracing and dewatering, testing and commissioning and additional work as may be noted on the Contract Drawings or specified herein.

All work under Item 21 shall be in conformance with Specification Sections 02315, 02740, 02820, 03005, 03400, 05500, 11001, 15060, 15070, 15100, 15122, 15200, 15990, 16050, 16060, 16070, 16075, 16120, 16130, 16140, 1623, 16260, 16300, 16360, 16410, 16410, 16420, 16440, 16510, 16700, and 16740.

ITEM 22 For the Valley View Circle Pump Station Complete and Operational

For the lump sum price bid, the Contractor shall furnish all labor, equipment, material and such additional work as may be required for constructing the Valley View Circle Pump Station, involving the construction of new wet well, pumps, valve chamber, vents, bollards, concrete pads, foundations, and structures, and all other work necessary to form a completed facility as shown on the Drawings and specified herein. The lump sum price shall generally include all work shown on Contract Drawings, with the exception of influent buried gravity sewer piping to the wet well and buried force main piping from the valve chamber. All clearing/grubbing, tree removal and site preparation shall be included in the lump sum bid price.

The work shall include all excavation, disposal of excess materials, backfill and backfill compaction with excavated material, sheeting, bracing and dewatering, testing and commissioning and additional work as may be noted on the Contract Drawings or specified herein.

All work under Item 22 shall be in conformance with Specification Sections 02315, 02740, 03005, 03400, 05500, 11001, 15060, 15070, 15100, 15122, 15200, 15990, 16050, 16060, 16070, 16075, 16120, 16130, 16140, 1623, 16260, 16300, 16360, 16410, 16410, 16420, 16440, 16510, 16700, and 16740.

<u>ITEM 23</u> For Furnishing and Installing 3-inch SDR-11 HDPE Sewage Force Main Including Laying, Jointing, Fittings, Valving, Stone Bedding, Testing and Restraint.

Payment for HDPE sewage force main shall be based on the linear foot of pipe measured in the field by the Engineer and shall include laying, jointing, fittings, valving, thrust blocks, stone bedding, testing and restraints. No payment shall be made for the distance between the inside faces of manholes and other structures. Pipe fittings on force mains shall be paid for on a lineal foot basis utilizing the laying length of each fitting. Payment for pavement replacement shall be made under the appropriate items in this speciation.

The work shall include all excavation, pavement removal, backfill and backfill compaction with excavated material, sheeting, bracing and dewatering, and additional work as may be noted on the Contract Drawings or specified herein.

All work under Item 23 shall be in conformance with Specification Sections 15122 and 15990.

ITEM 24 For Furnishing and Constructing Guard Rail

Under Item 24a steel beam guard rail will be measured along the top edge of the rail element from end to end of new guard rail installed in the field. Guard Rail will be paid for at the contract unit price per linear foot and shall include all connections to existing guard rails, guard rail posts, non-vegetative paving milling mulch, and all additional work as required to furnish and install a complete in place guard rail. The work under this item shall conform to the relevant provisions of Section 630 of MassDOT Standard Specifications for Highway and Bridges except, measurement and payment will be in accordance with this specification.

Under Item 24b for removal and disposal of existing guard rail will be measured along the top edge of the existing rail element for the actual amount removed and properly disposed of off-site. Compensation for this work will be made at the contract unit price per linear foot of guard rail removed and disposed, which price includes full compensation for dismantling, loading, transporting, and unloading highway guard, anchors, posts, cables, fittings and all other incidentals to complete this item in a satisfactory manner. The work under this item shall conform to the relevant provisions of Section 630 of MassDOT Standard

Specifications for Highway and Bridges except, measurement and payment will be in accordance with this specification.

ITEM 25 For Furnishing and Placing Flowable Fill

Measurement and payment for flowable fill used for pipeline encasement, utility crossings and where approved by the Engineer will be made for based on the cubic yardage poured in place in conformance with the pay limits. Contractor shall provide concrete slips for verification purposes. The Contractor's unit price submitted for this item shall reflect the above stipulated method for measurement and payment.

All work for Item 25 shall be in conformance with Specification Sections 02315.

ITEM 26 For Traffic Control and Signage

Traffic control will be on a lump sum basis. Payment of the lump sum bid price will be on a monthly basis as a percentage of the lump sump bid and the amount of work for that particular month. Payment will not be made until the Contractor is operational in the field.

All work for Item 26 shall be in conformance with Specification Section 01550.

ITEM 27 For Traffic Control Officers (Allowance)

The allowance shall be used to reimburse the Contractor for the actual direct costs incurred by the Contractor from the Police Department for off-duty uniformed law enforcement officer traffic control directors and associated administrative costs for providing traffic control during the Contract. The Contractor shall submit the invoices received from the Police Department for providing traffic control to the Owner without any mark-up and such costs shall be reimbursed to the Contractor with each monthly progress payment from the allowance included in the price bid under Item 28. The Owner shall not be responsible for additional traffic control costs beyond the number of working days specified in the construction.

All work for Item 27 shall be in conformance with Specification Section 01550.

ITEM 28 Monthly Price Adjustment for Hot Mix Asphalt (HMA) Mixtures

The Base Price of liquid asphalt shall be the Base Price as determined by MassHighway (http://www.massdot.state.ma.us/) for the month the project is bid. The period price shall be the Period Price of liquid asphalt for each monthly period as determined by MassHighway (http://www.massdot.state.ma.us/).

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M3.11.03.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of tons of hot mix asphalt mixtures placed during each monthly period times the liquid asphalt content percentage times the variance in price between Base Price and Period Price of liquid asphalt.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department approved extension of time.

ITEM 29 Monthly Price Adjustment for Diesel Fuel

The Base Price of Diesel Fuel will be the price as indicated in the Department's web site (http://www.massdot.state.ma.us/) for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices as indicated in the Department's web site (http://www.massdot.state.ma.us/) during each month as.

This adjustment will be affected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The price adjustment will be determined by multiplying the number of cubic yards of excavation and borrow (as defined in the next paragraph) paid during each one-month period by 0.29 gallons per cubic yard and adding that to the tons of hot mix asphalt paid during each one-month period by 2.90 gallons per ton. The total number of gallons calculated shall then be multiplied by the variance in price between Base Price and Period Price of diesel fuel.

ITEM 30 Monthly Price Adjustment for Gasoline

The Base Price of Gasoline Fuel will be the price as indicated in the Department's web site (http://www.massdot.state.ma.us/) for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices as indicated in the Department's web site (http://www.massdot.state.ma.us/) during each month as.

This adjustment will be affected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The price adjustment will be determined by multiplying the number of cubic yards of excavation and borrow (as defined in the next paragraph) paid during each one-month period by 0.15 gallons per cubic

yard. Monthly price adjustment for gasoline does not apply to surfacing work. The total number of gallons calculated shall then be multiplied by the variance in price between Base Price and Period Price of diesel fuel.

ITEM 31 Monthly Price Adjustment for Portland Cement in Concrete

The Base Price of Portland Cement in Concrete will be the price as indicated in the Department's web site (http://www.massdot.state.ma.us/) for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices as indicated in the Department's web site (http://www.massdot.state.ma.us/) during each month as.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01.

No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag. The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

END OF SECTION

SECTION 01310 PROJECT COORDINATION

PART 1: GENERAL

1.01 <u>SUMMARY</u>

The review and coordination of shop drawings, actual execution of the work, and testing between general construction work, equipment and piping installation, pertinent instrumentation and electrical work is the responsibility of the Contractor.

The Engineer will check each shop drawing submitted to determine whether it complies with the intent of the Contract Documents and the design. This same requirement is placed on the Contractor and his supplier.

It is the intention of the Contract Documents to place various materials of construction and related requirements in their proper place both on the Drawings and in the Specifications. However, no guarantee is made that such locations are, in every instance, where the Contractor might expect to find them.

The Contractor is required to provide, or make available, all of the Contract Documents to each vendor and subcontractor, both prior to bid to ensure proper Proposals, and during construction to ensure compliance with the intent of the Contract Documents. This is the sole responsibility of the Contractor.

The Engineer is not responsible for project coordination between various subcontractors, which is the responsibility of the Contractor. The Engineer will observe, by attendance at regularly scheduled job meetings, the orderly flow and progress of the work. The various subcontractors and those people responsible to them are required to interact with each other to ensure that the work progresses in an orderly fashion and without exceeding the time allotted in the Contract.

The Contractor is to refer to the appropriate section of the Contract Documents which defines the limitations of the Engineer's responsibilities.

The Contractor is responsible for reading all the Specifications and following the various Drawings. His review of all the Contract Documents as well as shop drawings, coordination drawings and other information required to complete the project is his sole responsibility. He is to request clarification on any matters where ambiguities might exist, in order to receive instruction as to the proper documents to follow.

All products or materials which require the selection of color finishes are to be submitted early and with sufficient lead time to permit the Owner or his Engineer to develop an overall color coordination system for use by the Contractor in the final installation. Delays in submitting such product or material samples or color charts at one time may delay the selection process and prevent the Contractor from granting suppliers final releases for fabrication.

Operation of existing facilities will be performed by the Owner unless otherwise specified. The Owner will assist in arranging operation of any existing facilities or equipment required by the Contractor to connect to existing facilities, and the Contractor shall not operate existing valves or equipment. Only the Owner will operate Owner valves.

1.02 PRECONSTRUCTION CONFERENCE

A preconstruction conference shall be held before construction starts. During the preconstruction conference the Owner, the Engineer, and the Contractor will discuss the procedures to be followed by the Contractor during construction. The Contractor shall be prepared to discuss the following:

- a. Project Scheduling
- b. Sequencing of critical path Work items
- c. Shop Drawing procedures
- d. Project changes and clarification procedures
- e. Use of site, access to Work areas, storage areas, security and temporary facilities
- f. Contractor safety plan and representative
- g. Progress payments and procedures
- h. Required documentation
- i. Project personnel contact list

1.03 PROGRESS MEETINGS

The Engineer may schedule regular job meetings at least monthly during the life of the Contract. The time and location of meetings is to be set by the Engineer. The Contractor, unless otherwise notified by the Engineer, is to have authorized representatives attend each meeting. Additional meetings may be called as progress of work on the project requires.

The purpose of these meetings is for maintaining communication between the Owner, Engineer and Contractor, including the Contractor's subcontractors and suppliers. The meetings are to be used to coordinate various parts of the work, update construction schedules, prepare progress estimates, and respond to questions which may be raised by the various participants.

The Engineer will preside over the job meetings and will be responsible for recording minutes of the meetings. The Engineer will distribute minutes of the meetings to meeting participants.

Attendants at job meetings shall include the Owner, the Engineer, the Contractor and subcontractors (as may be required or specifically requested by the Owner/Engineer).

Meeting agendas shall be established by the Engineer and shall include the following general items:

- a. Review/approve minutes of prior meeting;
- b. Review Work completed since the prior meeting;
- c. Review compliance with construction and shop drawing submittal schedules;
- d. Identify problem areas of the construction and shop drawing submission schedules and develop responses to resolve the problems;
- e. Establish detailed short-term construction schedule to identify work to be completed prior to the next job meeting;
- f. Identify Owner interaction required to complete the planned work;
- g. Review construction site procedures and safety measures;
- h. Establish date(s) for upcoming meetings and special agenda items;
- i. Establish start-up and testing procedures for new installation.

1.04 <u>COORDINATION</u>

- a. Retain a full-time English speaking Superintendent, satisfactory to the Owner and Engineer. The Superintendent shall not be changed except with the consent of the Owner and Engineer. The Superintendent shall be in full charge of the Work.
- b. Do not interfere with the operation of the existing facilities.
- c. Perform all coordination necessary to complete connections to the existing pipeline.
- d. Coordinate with appropriate utility companies, as well as with the Owner, where the Work crosses or is adjacent to existing utilities.

1.05 <u>SUBMITTALS</u>

- a. Informational Submittals
 - 1. Submit to the affected utility company, the Owner, and the Engineer, in writing, all requests for temporary shutdowns of facilities or interruption of operations. No shutdowns of the water system or interruptions to existing operations will be permitted except as outlined in this Section. Submit requests at least 2 weeks prior to the beginning of the Work requiring shutdown or interruption. No shutdown shall occur without the approval of the utility company or the Owner.
 - 2. At the pre-construction conference, supply to the Owner the cell phone number of a responsible person who may be contacted during off-hours for emergencies 24 hours a day, seven days a week.
 - 3. Prepare a contact list of phone numbers, including cell phone numbers, and emails for all Project personnel and submit to the Engineer at the pre-construction conference. Include Contractor, Sub-Contractors, Owner, Engineer, and City/Town personnel including police, fire, and ambulance.
 - 4. Submit to the Owner and Engineer, in writing, all requests for valve operations at least 2 weeks prior to commencing operation.
- b. Action Submittals
 - 1. Submit site usage plan showing all proposed staging areas, locations of all office and storage trailers, and material laydown areas within 30 days of the Notice to Proceed. The site usage plan should be a drawing showing the proposed locations and shall include on-site traffic modifications and temporary utilities as may be applicable.

1.06 PROJECT MANAGEMENT

- a. Retain a full-time Superintendent, satisfactory to the Owner and Engineer. The Superintendent shall not be changed except with the consent of the Owner and Engineer. The Superintendent shall be in full charge of the Work.
- b. Complete the Work in a continuous uninterrupted operation. Use sufficient personnel and adequate equipment to complete the Work within the Contract Time.

PART 2: <u>PRODUCTS</u>

Not Used.

PART 3: EXECUTION

3.01 <u>GENERAL</u>

Notify Dig Safe System, Inc. at 1-888-344-7233 at least 72 hours prior to any digging, trenching, rock removal, demolition, borings, backfill, grading, landscaping, or any other earth moving operations.

3.02 WORKING HOURS

- a. The Contractor should limit construction operations and activities between the hours of 7:00 a.m. to 5:00 p.m. No work is to be done on Owner's holidays, Saturdays, Sundays or outside of the work hours described above. No equipment or machinery may be started at the site before 7:00 a.m. and all equipment must be shut off by 5:00 p.m.
- b. No Work shall be conducted on Brush Hill Avenue, Piper Road, and Birnie Avenue between September 14 October 5, 2020. All surrounding Work areas shall be clean and all stored equipment within the Town right of way shall be removed. Temporary paving in disturbed areas in the aforementioned streets shall be completed by September 11, 2020.

3.03 <u>SEQUENCE OF CONSTRUCTION</u>

a. The Contractor shall begin construction no later than June 30, 2020, and will be expected to be substantially complete with all works in the Valley View Circle Sewershed by October 31, 2020.

3.04 CONSTRUCTION CONSTRAINTS

The following are constraints for the Work. Incorporate these constraints into the schedule required to be submitted under Section 01330, Submittal Procedures.

- a. All components of the existing system must remain in operation throughout construction of the proposed system unless otherwise specified.
- b. Full lengths of pipes, and structures may be stored in the right-of-way for a maximum of two weeks. Pipes must be neatly stacked and placed parallel to the roadway. All other materials shall not be stored in the right-of-way.
- c. Maintain public access to businesses and residences including driveways and parking lots at all times during the Work.
- d. Obtain a written agreement from the property Owner prior to utilizing private utilities or lands. Submit copies of all agreements to the Owner prior to using the utility or land.
- e. Arrange construction activity so that all streets shall remain open to unimpeded, two-way traffic during non-work hours.
 - 1. On main roads, no equipment shall remain in the roadway overnight.
 - 2. On secondary roads, Contractor shall place/park all equipment and vehicles in or off of the roadway such that, at a minimum, two 12-foot-wide travel lanes are maintained, allowing two-way traffic. Any damage to features not included in the project limits damaged by the movement of equipment or vehicles shall be repaired by the Contractor at no cost to the Owner. The area of the roadway where equipment and/or vehicles are being stored overnight shall be marked with reflective barricades.
- f. Backfill trenches to grade with gravel at the end of each working day.

3.05 AVAILABLE LAYDOWN AREA

a. The Owner has made available an area for Contractor's use as a laydown area for the Work, as shown on the Contract drawings.

3.06 COORDINATION WITH THE OWNER'S OPERATIONS

a. Notify the Owner and Engineer, in writing, a minimum of one week in advance of commencing Work on site. Work on site shall not occur until all required permits are obtained, and ground penetrating radar investigation reports have been submitted. Coordinate the operations of existing valves with the Owner and the Engineer. The opening and closing of existing valves will be performed by the Owner.

END OF SECTION

SECTION 01320 CONSTRUCTION PHOTOGRAPHS

PART 1: <u>GENERAL</u>

- a. Engage a qualified commercial photographer experienced in construction photography whose work is acceptable to the Owner and Engineer to take construction photographs.
- b. Submit one digital copy in UNPROCESSED RAW FORMAT and JPEG or TIFF format with Ownership or full usage rights of each photographic view within thirty (30) days of taking photographs. Digital images are to have a minimum resolution of 3872x2592 pixels (camera image sensor shall be capable of recording 10 megapixel minimum). Copies of digital images are to be provided to Engineer on high quality CD or DVD (700MB CD-R or 4.7 GB DVD-R or DVD+R in labeled "jewel" case). These requirements apply for all photographs to be taken as part of this contract including, but not limited to, Progress Construction Photographs, and Final Completion Construction Photographs.
- c. Identification: On CD or DVD case, provide an applied label or rubber-stamped impression with the following information:
 - 1. Name of Project.
 - 2. Name and address of photographer.
 - 3. Name of Engineer.
 - 4. Name of Contractor.
 - 5. Month photograph was taken.
- d. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

PART 2: <u>PRODUCTS</u>

Not Used

PART 3: <u>EXECUTION</u>

- a. <u>Progress Construction Photographs:</u> Take a minimum of fifteen (15) digital color photographs monthly coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.
- b. <u>Final Completion Construction Photographs:</u> Take a minimum of twenty (30) digital color photographs after date of Substantial Completion for submission as Project Record Document. Engineer and/or Owner will direct photographer for desired vantage points.
- c. The Engineer, at his discretion, may direct the manner, method, and units of the construction to be photographed; therefore, before pictures are to be taken, the Contractor shall notify the Engineer at least 24 hours in advance. In the event that the Contractor delays in complying with above requirements, the Engineer, in conjunction with the Owner, may call in an experienced photographer to take such photographs, and the cost thereof shall be borne by the Contractor

* * * END OF SECTION* * *

SECTION 01330 SUBMITTAL PROCEDURES

PART 1: <u>GENERAL</u>

1.01 BEFORE STARTING WORK

a. <u>Preliminary Progress Schedule</u>

In accordance with Section 2.05A of the General Conditions, the Contractor shall prepare and submit to the Engineer for approval, a preliminary construction progress schedule. This submittal is to be made within ten (10) days from the effective date of Agreement. Further, an approved preliminary construction progress schedule shall be submitted to the West Springfield Local Conservation Commission prior to the pre-construction meeting.

The schedule shall include, as a minimum, the following separate activities:

- 1. Physical construction (includes mobilization, demobilization, setup time, lags, etc.)
- 2. Issuance by Contractor of purchase orders for material and equipment and submittal of shop drawings and samples to the Engineer.
- 3. Review by Engineer for each submittal of samples and shop drawings. Unless otherwise approved by the Engineer, allow a minimum of twenty (20) working days for Engineer to review each submittal.
- 4. Fabrication time for materials and equipment.
- 5. Delivery of materials and equipment.
- 6. Installation of materials and equipment.
- 7. Testing, start-up and training for individual pieces of equipment or entire systems as appropriate.
- 8. Final inspection and testing
- 9. Punchlist
- 10. Final Cleanup
- 11. Winter affected activities.
- 12. Outages or interruptions of Owner's facilities required to perform work.

Activity durations shall represent the best estimate of elapsed time considering the scope of the Work involved in the activity and the resources planned for accomplishing the activity expressed in working days.

Activity descriptions shall clearly define the scope of work associated with each activity. If activity descriptions contained in the schedule are not sufficient to describe the work, a supplemental narrative description is to be provided.

The construction work shall be detailed to an extent that progress can be readily monitored on a daily basis. In general, the construction work shall be detailed such that no construction activity shall have a duration greater than fifteen (15) work days. Progress Schedule shall reflect Work restrictions as outlined in Section 01310, Project Coordination.

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The above schedule development requirements are a minimum and the Contractor shall develop the schedule as necessary to properly control and manage the project.

The preliminary progress schedule shall be submitted in a network analysis format and shall include, as a minimum, a graphic representation of all significant activities and events involved in the construction of the project, and a written statement explanatory thereof for a complete understanding of the diagram.

The graphic representation and statement must clearly depict and describe the sequence of activities planned by the Contractor, their interdependence and the times estimated to perform each activity. The network shall be submitted on sheets 24" x 36" and may be divided into as many separate sheets as required.

b. <u>Shop Drawings and Samples Submittal Schedule</u>

The preliminary progress schedule shall contain activities in the network representing submittal and review of shop drawings and material samples. The shop drawing and sample submittal schedule required per Paragraph 2.05 of the General Conditions shall be developed by sorting these activities from the progress schedule. The schedule shall be presented in a report format containing the following information:

- a. Activity number
- b. Activity description (including reference to the appropriate specification section)
- c. Early and late start dates
- d. Early and late finish dates
- e. Total and free float
- f. Successor activities

c. <u>Schedule of Values</u>

In accordance with Section 2.05 of the General Conditions the Contractor shall submit to the Engineer a schedule of values representing a detailed subdivision of the lump sum Contract items. This subdivision, when approved by the Engineer, will become the basis for computing the Contractors monthly progress payments. If practical, the schedule of values shall be developed by assigning a cost value to the appropriate activities contained in the preliminary progress schedule. If activities, or other line items, in the schedule of values contain costs associated with material, labor or subcontracts these costs are to be identified separately by listing the activity multiple times and identifying material, labor and subcontract with a suffix M, L and S respectively. Cost values for activities representing materials/equipment only shall be assigned to the activity representing delivery of such material/equipment to the job site.

In addition to the cost of material, labor and subcontracts, the following costs are to be identified separately in the schedule of values accompanied by such supporting documentation as required by the Engineer to substantiate the amounts listed.

- 1. Mobilization To include Contractor's actual cost to setup temporary facilities at the job site.
- 2. Bonds, Insurance To reflect premiums paid, or to be paid, for Bonds and insurance required to be provided per the Contract Documents. Additional insurance coverage or bonds

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purchased by the Contractor at his option shall be considered general overhead and apportioned to construction activity costs.

- 3. Job Site Overhead To reflect the cost of maintaining the temporary facilities at the job site including the cost of direct field supervision. This value, when approved, will be paid to the Contractor in equal monthly increments based on the number of months between mobilization and final completion.
- 4. Demobilization To reflect the cost of removing the temporary facilities and final site cleanup.
- 5. Permits To include fees required for any permits which Contractor is required to obtain including inspection fees associated with such permits.

The cost of home office overhead, profit, financing, contingencies, etc. are to be apportioned to the construction activities in the schedule of values based on the percentage that each construction activity cost represents when compared to the subtotal of all construction activity costs. This subtotal is excluding mobilization, demobilization, job site overhead, permits, home office overhead, profit, financing, contingencies, etc. The total of all items in the schedule of values shall equal the Contract Price.

d. <u>Preconstruction Color Audio-Video Documentation Survey</u>

Prior to mobilization at the site, the Contractor shall furnish to the Engineer a video recording of all planned construction areas, material storage areas, areas adjacent to these areas, including but not limited to, streets, driveways, sidewalks, curbs, ditches, fencing, railing, visible utilities, retaining structures and adjacent building structures. The purpose of the video documentation is to document existing conditions and to provide a fair measure of required restoration. Care should be taken to record all existing conditions which exhibit deterioration, imperfections, structural failures or situations that would be considered substandard.

The documentation shall be performed by a professional firm specializing in audio-video work. Audio-video recording shall be in digital (USB Drive) format. Video output from camera(s) used must be capable of producing NTSC-500 lines. Resolution in the Y channel, minimum 500 TV lines at center. Geometric Distortion shall not exceed 2% of picture height at any point in picture area. The documentation shall include an audio soundtrack to provide the following information:

- 1. Detailed description of location being viewed referenced to Contract Drawings (i.e. station no., building designation, pipeline route etc.)
- 2. Direction (N, S, E, W, looking up, looking down, etc.) of camera view
- 3. Date, time, temperature, environmental conditions at time of documentation.

Any areas not readily visible by documentation methods shall be described in detail. Unless otherwise approved by Engineer, documentation shall not be performed during inclement weather or when the ground is covered partially or totally with snow, ice, leaves, etc.

6 USB drives of the information requested in this section shall be prepared. The original documentation shall be submitted to the Engineer accompanied by a detailed log of the contents of each USB drive. The log should include location descriptions with corresponding USB drives. The USB drives will be maintained by the Engineer during construction and may be viewed at any time by Contractor upon request. Upon final acceptance, the USB drives will become the permanent property of the Owner.

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1.02 FINALIZING SCHEDULES

The Contractor shall be prepared to present and discuss at the preconstruction conference, the schedules submitted in accordance with this specification. Unless additional information is required to be submitted by the Contractor, the Engineer will, within 15 working days of the preconstruction conference, provide comments to the Contractor. The Contractor shall then resubmit the affected schedules addressing the Engineer's comments.

Approval of the final schedules by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the Contract Times. Omissions and errors in the approved CPM schedule shall not excuse performance less than that required by the Contract. Approval by the Engineer in no way makes the Engineer an insurer of the success of those schedules or liable for time or cost overruns flowing from shortcomings in such schedules.

1.03 <u>2-WEEK SCHEDULE</u>

The Contractor shall prepare and submit to the Engineer a detailed analysis of the construction progress schedule. This schedule shall detail a two (2) week time period, including the week which the schedule is submitted and the week following. The schedule shall be updated weekly and submitted to the Engineer on the first work day of the same week. The use of a computer to generate the 2-week schedule is not required.

The Contractor shall include, as a minimum, a graphic representation of all Contractor activities, Subcontractor work, material deliveries, shop drawing submittals, plant shut downs, and other information relevant to the project's schedule.

The schedule shall be submitted on a form approved by the Engineer.

The Contractor shall submit a 2-week schedule to the Engineer one (1) week prior to mobilizing onto the project site and update the schedule every week thereafter until completion of the project.

The 2-week schedule shall be submitted in addition to the CPM schedule.

1.04 REQUIREMENTS FOR CONFORMING WITH SCHEDULE

If, in the opinion of the Engineer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as will be necessary to improve his progress, and Engineer may require Contractor to increase the number of shifts and/or overtime operations, days of work, and/or the amount of construction planned, and to submit for approval such supplementary schedule or schedules as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Owner. An updated cash flow schedule will be required in this occurrence and will be provided with the supplementary schedules referenced above.

1.05 <u>UPDATING SCHEDULES</u>

The Contractor shall submit to the Engineer quarterly updates of the schedules required per this specification section.

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Progress and shop drawing schedule updates shall reflect the progress to date by providing actual start dates for activities started, actual finish dates for completed activities, and identifying out of sequence work, schedule logic changes and any circumstances or events impacting the current schedule. The updates shall also contain the Contractor's best estimate of the remaining duration for activities not complete as of the date of the update. All graphic presentations, reports and computer discs required per the initial submittal of these schedules shall be provided with each update.

The schedule of values and cash flow schedules shall be updated to reflect any changes.

1.06 ADJUSTMENT OF PROGRESS SCHEDULE AND CONTRACT TIMES

If the Contractor desires to make changes in his method of operating which affect the approved progress schedule, he shall notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer approves these changes, the Contractor shall revise and submit for approval, without additional cost to the Owner, all of the affected portions of the schedule.

Shop drawings and samples which are not approved on the first submittal or within the schedule time shall be immediately rescheduled, as well as any work which fails to pass specified tests or has been rejected.

The Contract Times will be adjusted only for causes specified in the General Conditions. In the event the Contractor requests an adjustment of the Contract times, he shall furnish such justification and supporting evidence as the Engineer may deem necessary for a determination as to whether the Contractor is entitled to an adjustment of Contract Times under the provisions of the General Conditions. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any adjustment of the Contract Times the Engineer's determination as to the total number of days adjustment shall be based upon the currently approved progress schedule and on all data relevant to the adjustment. The Contractor acknowledges and agrees that actual delays in activities which, according to the progress schedule, do not affect the Contract Completion date shown by the critical path in the network will not be the basis for an adjustment of Contract Times.

From time to time it may be necessary for the progress schedule and/or Contract Times to be adjusted by the Owner to reflect the effects of job conditions, weather, technical difficulties, strikes, unavoidable delays on the part of the Owner, and other unforeseeable conditions which may indicate schedule and/or Contract Times adjustments. Under such conditions, the Engineer shall direct the Contractor to reschedule the work and/or Contract Time to reflect the changed conditions, and the Contractor shall revise his schedule accordingly. No additional compensation shall be made to the Contractor for such changes except as provided in the General Conditions. Unless otherwise directed, the Contractor shall take all possible actions to minimize any extension to the Contract Times and any additional cost to the Owner.

1.07 SHOP DRAWINGS AND PRODUCT DATA

The Contractor shall promptly supply to the Engineer for approval, shop drawings and product data with details and schedules for all items as required in the Specifications, or for other items as may be required by the Engineer. No extension of time will be authorized due to failure to provide approvable submittals sufficiently in advance of the Work.

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Review Shop Drawings, product data, and samples prior to submission and verify and determine:

- a. Field measurements
- b. Conformance with the Contract Documents. Advise the Engineer in writing of any deviations from the requirements of the Contract Documents.
- c. Delete or strike out information that is not applicable to the Work.

Submittal files shall be transmitted electronically via e-mail and/or a submittal exchange folder. Engineer's point of contact(s) for electronic transmittal of submittals will be established during the pre-construction meeting. Files must be in .pdf format. Submittal responses will be returned in electronic .pdf format via e-mail and/or submittal exchange folder.

In addition to the electronic submission requirement, submit four hard copies, two for Owner and two for Engineer, of all drawings, product data, schedules and brochures for approval. Black line prints, blue line prints or reproducible transparencies are required. Blueprints (white lines on a blue background) are <u>not</u> acceptable.

Each submittal shall have the job name on it and the appropriate Specification section or Drawing reference. Submittals shall be numbered sequentially, with the applicable Specification section and a hyphen preceding the number. (e.g. Submittal number 11330-01). Resubmittals shall bear the same transmittal number with a sequential letter suffix commencing with "A". (e.g. Submittal number 11330-01A).

As required by the General Conditions, each copy of the submittals shall also be stamped with the Contractor's approval indicating that the submittal has been reviewed for conformance to the Contract Documents and has been coordinated with all other work and/or trades. For shop drawings being resubmitted the Contractor shall identify and bring to the attention of the Engineer any revisions other than those originally requested by the Engineer. Submittals smaller than $8\frac{1}{2} \times 11$ inches shall be secured to paper $8\frac{1}{2}\times 11$ inches.

Action Submittals: includes written and graphic information submitted by Contractor that requires Engineer's approval. The Contractor shall be responsible for furnishing subcontractors with approved shop drawings as required. No shop drawings are to be used for construction, ordering, fabrication, or other reasons unless marked "Approved" or "Approved as Noted" by the Engineer.

Submittals will be returned, stamped with the following classifications:

- a) "Approved" There are no notations or comments on the submittal and, in our opinion, the submittal meets the requirements of the Contract Documents and the CONTRACTOR may release the equipment for production.
- b) "Approved as Noted" Notations have been made on the submittals to insure conformance with the Contract Documents. The CONTRACTOR may release the equipment for production in accordance with the notations.
- c) "Not Approved" The submittal does not meet the requirements of the Contract Documents. The CONTRACTOR must submit the specified product.

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- d) "Revise and Resubmit" When the material submitted is incorrect or insufficient to review properly and it is necessary to see the complete package again.
- e) "Resubmit Record Copy" Used with the review action "Approved As Noted". The resubmittal shall incorporate notations.

Informational Submittals: includes information submitted by Contractor that does not require Engineer's approval. The Engineer will acknowledge receipt of such documents and provide comments when the submittals lack the detail required by the Contract Documents.

Where a submittal indicates a departure from the Contract which the Engineer deems to be a minor adjustment in the interest of the Owner not involving a change in Contract Price or extension of Contract Times, the Engineer may approve the submittal but the approval will contain, in substance, the following notation:

"The modification indicated on the attached submittal is approved in the interest of the Owner to effect an improvement for the Project and is accepted with the understanding that it does not involve any change in the Contract Price or Times; that it is subject generally to all Contract stipulations and covenants; and that it is without prejudice to any and all rights of the Owner under the Contract Bonds."

It is emphasized that the Engineer's approval of Contractor's submitted data is for general conformance to the Contract Drawings and Specifications, but subject to the detailed requirements of Drawings and Specifications. Although the Engineer may check submitted data in more or less detail, such checking is an effort to discover errors and omissions in Contractor's drawings and to assist the Contractor in coordinating and expediting his work, and shall in no way relieve the Contractor of his responsibility to Engineer the details of the Work in such manner that the purpose and intent of the Contract will be achieved, nor shall such detail check by the Engineer be construed as placing on the Engineer, any responsibility for the accuracy, and for proper fit, functioning and performance of any phase of the Work included under this Contract. If the Contract Documents, the Contractor shall provide written notice to the Engineer at least 7 working days prior to release for manufacture. D. When the submittals have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

Submittals shall be transmitted as a complete package by Specification section, unless otherwise reviewed and approved by the Engineer. It is the intent that all information, materials, and samples associated with each Specification section be included as a single submittal for the Engineer's review. Engineer will return entire submittals if preliminary review deems it incomplete including:

- a. Missing or incomplete Contractor's approval
- b. Insufficient number of copies
- c. Missing content

Partial submittals may be considered, at Engineer's option, only when necessary to expedite the Project. Partial submittals shall be clearly identified as such on the transmittal to identify missing components.

507408636-002 February 2020 A maximum of two re-submissions of each shop drawing will be reviewed, checked and commented upon without charge to the Contractor (total of 3 submittals). Any additional submissions which are required by the Engineer to fulfill the stipulations of the Contract Documents will be charged to the Contractor.

1.08 <u>SAMPLES</u>

When required by the Engineer or where noted in other Sections of these Specifications, samples or materials shall be submitted for approval. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work. Submit samples of finishes from the full range of manufacturer's standard colors, textures, and patterns for Engineer's selection. Include identification on each sample, with full project information. Submit the number or samples specified in individual specification sections; one of which will be retained by Engineer. Reviewed samples which may be used in the Work are indicated in individual specification sections.

1.09 PROGRESS PAYMENTS

The detailed arrangement for submittal of progress payments shall be discussed at the preconstruction conference. In general, progress payments shall be submitted monthly in a format acceptable to the Engineer. The progress payment request shall be based on the approved schedule of values and should provide the percentage of completion, total dollar value completed, dollar value completed prior to the current payment, and the amount requested for this progress payment for each line item contained in the schedule of values. Progress payment requests for material and/or equipment suitably stored but not yet incorporated into the work shall be accompanied by a copy of the appropriate manufacturers invoice, shipping order, bill of lading, etc. and the progress payment amount shall be the direct cost to the Contractor, or Subcontractor, for such material and/or equipment. Payment will not be made to the Contractor if, upon inspection by the Engineer, it is determined that the material and/or equipment does not conform to the requirements of the Contract Documents including proper storage, receipt of approved shop drawings, receipt of any special guarantees, Bonds, insurance coverage, any evidence of damage or imperfections, etc.

1.10 CONTRACTOR'S DAILY REPORTS

If requested by the Engineer or the Resident Project Representative, the Contractor shall prepare and submit daily reports containing the following information:

- a. Number of craftsmen and hours worked of each Subcontractor
- b. Number of hours worked by each trade
- c. Number of hours worked of each type of equipment
- d. Description of work activities performed
- e. Description of any material or equipment deliveries
- f. Description of obstructions encountered
- g. Temperature and weather conditions

The daily reports shall be submitted on a daily basis, by the end of the next business day. Information provided on the daily report <u>shall not</u> constitute notice of delay or any other notice required by the Contract Documents. Notice shall be as required therein.

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1.11 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

Prepare complete written maintenance and operating instructions covering the equipment provided under this Contract. Divide the operating instructions into basic sections according to type of equipment.

Instructions shall describe all equipment and controls, their purpose, and their operation and use. Include maintenance checklists for use by the Owner's personnel and a complete listing of replacement parts with pertinent information relative to ordering such parts.

Submit instructions in duplicate draft form for review by the Engineer at least eight weeks prior to initial operation, and in final form within thirty days after return of one copy of the draft with the Engineer's notations.

Prior to release of Final Payments, revise and resubmit copies of the instructions to accord with any changes in procedures or equipment made during start-up or initial operation. Resubmittals are also required for changes made during the guarantee period.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

END OF SECTION

SECTION 01450 QUALITY CONTROL

PART 1: <u>GENERAL</u>

1.01 CONFORMANCE TO DRAWINGS AND SPECIFICATIONS

a. All Work is to conform during its progress and upon its completion truly to the lines, levels and grades indicated on the Drawings or given by the Engineer and is to be built in a thoroughly substantial and workmanlike manner, in accordance with the Drawings, Specifications and directions given from time to time by him. In no case will any work in excess of Drawing requirements and Specifications be paid for, unless ordered in writing by said Engineer.

1.02 LINES, GRADES AND MEASUREMENTS

- a. The controlling bench marks and field ties as shown on the drawings are to be used by the Contractor, who is to provide at his own expense such stakes, batter boards, forms, materials and labor as may be required. Additional batter boards, lines, grades and forms may be furnished and set by the Contractor if so desired.
- b. The Contractor is to adequately protect all monuments, stakes and marks set by the Engineer. If they are disturbed or obliterated during the progress of the work, or otherwise they will be replaced by the Engineer at the Contractor's expense. After the Contractor has erected batter boards or forms, and set elevations for the structures, the Engineer is to be afforded the opportunity to check such work for alignment, grade and location of steel, piping or equipment.

1.03 DIMENSIONS OF EXISTING STRUCTURES

a. The Contractor is to verify in the field, the dimensions and locations of existing structures, where an error or incomplete information relative to the location or dimension of existing structures would affect the construction to be done under this Contract. The Contractor is to verify such dimensions and locations before continuing with the construction work to the point where it would be affected.

1.04 <u>DATUM</u>

a. All elevations shown on the Drawings or used in the Specifications are expressed in feet above the North American Vertical Datum of 1988 (NAVD88) unless otherwise noted.

1.05 STANDARD SPECIFICATIONS

a. All standard specifications referred to herein, such as ANSI, ASTM, AWWA, and the like, unless otherwise noted are to be the latest revision thereof, at the time of bidding.

1.06 SERVICES OF TESTING LABORATORIES AND SPECIAL CONSULTANTS

a. The Owner may retain and, except as otherwise specified, pay for the services of an independent testing laboratory to do such sampling and to make such tests as the Owner or Engineer may deem necessary to verify that the materials and equipment proposed for or incorporated into the Work conform to the requirements of the Contract Documents.

PART 2: PRODUCTS

Not Used.

PART 3: <u>EXECUTION</u>

3.01 WATERTIGHTNESS

- a. The attention of the Contractor is called to the specific requirements of this Contract whereby the most rigid supervision will be required to ensure an absolute minimum of leakage or infiltration in the case of liquid conveying or liquid containing structures.
- b. In general, all structures and all pipe and appurtenant structures are to be of watertight construction. Any leakage is to be repaired in accordance with the appropriate sections of the Specifications.
- c. The Contractor is to provide, maintain and operate suitable and adequate dewatering equipment to insure satisfactory construction and maximum progress.
- d. In certain instances, dewatering permits may be required by regulatory agencies. The Owner shall obtain such permits from the Massachusetts Department of Environmental Protection.

3.02 <u>CLEAN-UP</u>

- a. During the course of construction all efforts must be made to maintain a neat and orderly project. Clean-up is to be pursued on a regular basis and in conjunction with the construction. The Contractor is to be responsible for clean-up during the life of this Contract with the full cooperation of all Subcontractors. Upon completion of all construction, final clean-up is to include removal of all excess materials, equipment, backfill, etc., and the site is to be restored to a condition equal to or better than that existing prior to construction. Should the Contractor fail to remove such material, equipment and supplies, the Owner has the right to remove them at the expense of the Contractor.
- b. At the completion of construction, the Contractor must tear down and remove all temporary structures unless expressly directed otherwise, and remove remaining rubbish of all kinds from all Contract structures, and from the site occupied during the progress of the work. The Contractor is to remove all concrete and ballast droppings and leave the site and the adjacent property that may have been affected by his operations in a neat and satisfactory condition. All structures and parts thereof constructed by the Contractor are to be thoroughly cleaned and left in first-class condition.

END OF SECTION

SECTION 01500 BYPASS PUMPING SYSTEM

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

a. Provide, install and test by-pass pumping systems to maintain wastewater flows during reconstruction of existing sanitary sewer system.

1.02 <u>RELATED WORK</u>

- a. Section 01310: Project Coordination
- b. Section 01730: Selective Demolition

1.03 <u>SYSTEM DESCRIPTION</u>

- a. General:
 - 1. The Contractor shall provide a by-pass pumping system for the purpose of providing sufficient by-pass pumping capacity throughout the duration of the project.
 - 2. In all cases existing flow must be maintained to prevent backup of flow in upstream manholes and/or house services.
 - 3. The by-pass pumping system provided by the Contractor shall include all required supervision, materials, labor, and equipment necessary to operate and maintain a temporary pumping system for the purpose of diverting the wastewater flow from the existing sanitary sewer system during the removal and replacement of existing manholes and sanitary sewer piping throughout the project.
 - 4. The design, installation, operation, and maintenance of the temporary bypass pumping system shall be the Contractor's responsibility.
 - 5. The Contractor shall employ the services of a qualified vendor experienced in the design and operation of reliable temporary standby pumping systems.
 - 6. During the operation of the standby pumping system, the Contractor shall not be permitted to stop or impede the flow of wastewater under any circumstance.

- b. Design Conditions:
 - 1. Brush Hill Avenue
 - a. Average Flow 100 GPM
 - b. Peak flow 300 GPM.
 - 2. Jeffrey Lane
 - a. Average Flow 100 GPM
 - b. Peak flow 300 GPM.
 - 3. The existing sanitary sewer system and existing wastewater flows at other project locations shall be maintained throughout the duration of the project.
- c. System Operation:
 - 1. The by-pass pumping system shall provide 120% of the flow capacity as noted in Part b above and shall be activated during the replacement of the existing sanitary sewer pipe and sanitary sewer manholes.
 - 2. The Contractor shall provide a means of annunciating shutdown or failure of the by-pass pumping system such that his personnel on-site are made aware of the need to activate the standby pumping system and are afforded adequate time to activate the system such that the flow of wastewater is not interrupted and such that there are no spills or leakages of wastewater.
 - a. The Contractor shall have the option of providing and installing his own alarm system and/or temporarily tying into new or existing, as appropriate, station alarms.
 - 3. The Contractor shall have the option of providing for automatic activation of the standby pumping system, however, provision of a system for automatic activation shall not preclude the Contractor from providing a means of annunciating a by-pass pumping system shutdown or failure or from providing personnel on-site on a continuous basis to man the standby or by-pass pumping system as specified in Part 1.06 of this Specification.

1.04 **QUALITY ASSURANCE**

- a. Vendor's qualifications:
 - The vendor of the by-pass pumping system shall have not less than five
 (5) years experience in the design and operation of standby pumping systems of similar size and complexity.

2. The by-pass and standby pumping system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

1.05 <u>SUBMITTALS</u>

- a. The Contractor shall prepare and submit to the Engineer specific detailed descriptions of the proposed temporary standby pumping system and other items listed below. In addition, the Contractor shall prepare and submit to the Engineer an emergency response plan for dealing with any emergency situation that may arise during the operation of the standby pumping system.
- b. Submit detailed plans and descriptions outlining all provisions and precautions to be taken regarding the handling of specified design wastewater flows. The submitted plans and descriptions shall be specific and complete and include such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary to ensure proper protection of the facilities and compliance with specified requirements.
- c. Submit, as a minimum, the following:
 - 1. Layout drawings indicating staging locations and sizes of pumping equipment & appurtenances, type and routing of suction and discharge piping, and connection of discharge piping to the system.
 - 2. Sewer plugging method and types of plugs.
 - 3. Number, size, material, location, and methods of installation of suction and discharge piping and all valves and appurtenances.
 - 4. By-pass and standby pump sizes, capacities, number of each size pump to be on site, power requirements, performance curves, schematic control and power wiring diagrams, and all other relevant manufacturer's literature.
 - 5. Calculations for selection of by-pass pump sizes, including static lift, friction losses, and flow velocities. This information shall be noted for the record.
 - 6. Details of temporary pipe supports and supporting structural calculations. Calculations will be noted for the record.
 - 7. Written description of Contractor's plan to operate and maintain the bypass pumping system including schematic wiring diagrams for all annunciation and control systems and connections of annunciation and control systems to new or existing, as appropriate, station alarms and/or controls.

- 8. Five (5) references of projects of similar size and complexity performed within the last five years.
- 9. Written description of emergency response plan.

1.06 SPECIAL PROJECT PROCEDURES

- a. Uninterrupted pumping of the entire influent wastewater flow to the downstream manhole shall be maintained at all times. Therefore, all necessary equipment and manpower shall be provided to maintain a continuous and reliable pumping operation while the by-pass pumping system is operating.
- b. By-pass pumping system shall be manned by the Contractor's personnel at all times throughout the duration of the project, 24 hours a day, 7 days a week.
- c. The Contractor shall be responsible for any spill of raw wastewater that occurs due to the operation of the temporary by-pass pumping system, in addition to any and all fines imposed on the Owner by the MassDEP or any other regulatory agency. All wastewater spills shall be reported to the MassDEP.

1.07 CONSTRUCTION COORDINATION AND SEQUENCING

a. The Contractor's attention is directed to the requirements of section 01310.

PART 2 - <u>PRODUCTS</u>

2.01 <u>PUMPING EQUIPMENT</u>

- a. Pumping equipment and drives shall be rated for continuous duty and shall be capable of pumping the specified flow range without surging, cavitation or vibration.
- b. Pumps shall be constructed to allow for dry running for long periods of time to accommodate the cyclical nature of wastewater flow.
- c. Pumping equipment shall not overload the driver at any point on the pump operating curve.
- d. All rotating elements shall be statically and dynamically balanced.
- e. Pumping equipment shall be suitable for use with raw unscreened sewage.
- f. The pumps shall be self-contained units, designed for continuous use.
- g. All pumps used shall be fully automatic self priming units that do not required the use of foot-valves or vacuum pumps in the priming system.

- h. All pumps used shall be diesel fuel motor driven and conform to the noise limitations of the contract documents.
- i. The Contractor shall provide a sufficient number of pumping units to meet the specified average/maximum daily flow specified in Part 1.03 of this Specification.
 - 1. Provide and maintain one backup pump of each size on site.
 - 2. Backup pumps shall be on-line and isolated from the primary operating system through valving.

2.03 PIPING AND APPURTENANCES

- a. A minimum of two (2) discharge pipelines shall be installed; one operational and one standby. All temporary piping and hosing shall be constructed with leak proof connections.
- b. Adequate vents shall be installed to prevent excess stress on the pipeline and the possibility of collapse.
- c. Piping materials:
 - 1. High-density polyethylene as manufactured by Phillips Driscopipe, Plexco, or equal.
- d. Valves shall be provided on individual bypass pipelines for isolation purposes; if one particular pipeline develops a problem, that pipeline shall be isolated by valves and the other pipeline placed into service.
- e. Provide all pipe supports and hangers necessary.
- f. Provide check valves as necessary.
- g. Provide all fittings necessary for tie-in of discharge piping at locations indicated on the Drawings. Restore tie-in locations to original condition upon removal of standby pumping system.

PART 3 - <u>EXECUTION</u>

3.01 INSTALLATION

- a. All equipment and material utilized shall be installed in strict accordance with the manufacturer's instructions and recommendations.
- b. Installation shall include furnishing oil, grease, lubricants, tools and spare parts that may be required as recommended by the equipment manufacturers to

maintain the operation of the standby pumping system throughout the construction period.

- c. The Contractor shall be solely responsible for maintaining the by-pass and standby pumping system and appurtenances.
- d. The pumps are to be installed at locations proposed by the Contractor and approved by the Engineer. They shall be installed for temporary use only and shall be removed by the Contractor at the completion of the Contract. Coordinate and sequence installation and removal of standby pumping system in accordance with Section 01310.
- e. The Contractor shall ensure that the temporary standby pumping system is properly maintained and a responsible operator present 24 hours a day, 7 days a week, throughout the duration of the project.
- f. After the Engineer gives approval to remove the temporary by-pass pumping system, the Contractor shall remove all components and provide proper drainage of all pipelines to prevent spillage of wastewater. The Contractor shall perform all site restoration work to the satisfaction of the Engineer.

3.02 FIELD QUALITY CONTROL

- a. The by-pass pumping system shall be fully tested and accepted prior to utilization of the system and prior to the commencement of demolition activities.
- b. Remove and replace equipment at Contractor's expense if unable to demonstrate to satisfaction of Engineer that units will perform the service required.

*******END OF SECTION***

SECTION 01520 CONSTRUCTION FACILITIES AND TEMPORARY UTILITIES

PART 1: <u>GENERAL</u>

1.01 <u>MAINTENANCE OF STRUCTURES, UTILITIES, AND NATURAL OR MAN-MADE</u> <u>SURROUNDINGS</u>

- a. All existing utilities and/or process systems are to be kept in operation at all times during construction operations unless prior arrangements have been made to provide alternative service.
- b. From the commencement of work, the Contractor is to be solely responsible for the care of the work during its progress for materials delivered and intended to be used, and for the protection to existing structures and trees or shrubs on or adjacent to the site of the work. Any injury or damage to the same is to be made good at the Contractor's expense.

1.02 OCCUPYING PRIVATE LAND

a. The Contractor is not to enter or occupy with workers, tools, materials, or equipment, any land outside the easements or property of the Owner, unless written consent from said private property Owner has been given to the Contractor and a copy of the consent provided to the Owner beforehand. Any written authorizations shall be submitted to the Owner and Engineer a minimum of 48-hours prior to use of the private property.

1.03 EXISTING CONSTRUCTION AND FACILITIES

a. When new construction is adjacent to or crosses streets or utilities under the jurisdiction of State, County, City or other public agency, public utility or private entity, the Contractor must secure written permission from the proper authority before executing such new construction. A copy of this written permission must be filed with the Owner before any work is done. The Contractor is to replace or repair all existing construction damaged in the execution of this contract. The Contractor will be required to furnish a release from the proper authority before final acceptance of the work.

1.04 <u>PUBLIC CONVENIENCE</u>

- a. The Contractor is at all times to conduct his work so as to ensure the least possible obstruction to traffic and inconvenience to the general public and residents in the vicinity of the work, and to insure the protection of persons and property. No road or street is to be closed to the public except with the permission of the proper authorities.
- b. Fire hydrants on or adjacent to the work are to be kept accessible to fire-fighting equipment at all times. Temporary provisions are to be made by the Contractor to ensure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which are not to be obstructed.
- c. The Contractor is solely responsible for satisfactorily maintaining flows in the existing utilities, affected by the work, at all times during the course of construction, unless otherwise indicated in the Contract Documents. All costs for such maintenance are deemed to

be included under the price bid and no additional costs are to be paid by the Owner for any work involved in this maintenance.

d. The Contractor is to review his construction schedule with the Municipal Engineer and the Police Department with respect to interruption of traffic and revise it accordingly if the Municipal Engineer or the Police Department so requires.

1.05 <u>TEMPORARY UTILITIES</u>

- a. The Contractor is to make all necessary arrangements for temporary utilities required or herein specified. No specific payment will be made for the costs of such utilities, but the costs thereof are to be included in the price bid for the work. He is to furnish, erect, maintain and remove the construction plant and such temporary works as may be required. These requirements include, but are not restricted to, suitable quarters for workers where necessary, including temporary sanitary facilities, water supply, heat and light for the workers as well as for construction purposes. Temporary roads, guards, lights and signposts are to be included, as necessary. Contractor shall provide a first aid station at the site. Upon completion of the work, the temporary utilities shall be removed.
 - 1. Telephone: The Contractor is to provide a job site telephone or use public pay phones at no charge to the Owner.
 - 2. Electric: The Contractor shall provide temporary electricity for himself and his subcontractors.
 - 3. Water: The Contractor may be allowed to use City water for temporary water required during construction. The Contractor shall obtain written permission from the Owner for use of any hydrants for this project, prior to their use. (A copy of this letter shall be sent to the Engineer.) The cost of temporary utilities is to be borne by the Contractor and included in the various unit prices bid.

1.05 TEMPORARY SANITARY AND FIRST AID FACILITIES

- a. Provide suitably enclosed chemical or self-contained toilets for the use of the labor force employed on the Work. Toilets shall be located near the Work sites and secluded from observation insofar as possible. Toilets shall be serviced weekly, kept clean and supplied throughout the course of the Work.
- b. Contractor shall enforce proper use of sanitary facilities.
- c. Use of the Owner's sanitary facilities by the Contractor is prohibited.
- d. Provide a first aid station at the site.

PART 2: <u>PRODUCTS</u>

Not Used

PART 3: <u>EXECUTION</u> Not used

END OF SECTION
SECTION 01550 TRAFFIC REGULATION

PART 1: GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. Contractor shall furnish and install all traffic barricades, markers, signs, controls and provide traffic police and other facilities required by the Federal, State and local government authorities and the Engineer to protect general public and maintain the existing roads, streets and highways.
- b. Any work performed as part of the Contract that will interfere with the efficient flow of traffic shall have police officers on site. The number of off-duty officers and actual hours that will be required is at the discretion of the appropriate local Police Department. If there are not enough police officers signed up for the job or no police officers are available, then uniformed traffic control guards shall be used.
- c. It is the Owner's responsibility to pay for police details if they are required. Contractor is responsible for scheduling the traffic officers, with Owner's approval, and for providing all documentation.
- d. The Contractor shall be responsible for furnishing, installing and maintaining all construction warning signs, barricades, detour signs and road closed signs required in accordance with the Manual on Uniform Traffic Control Devices per MGL Chapter 85, Section 2, and as specifically required by the appropriate local Police Department.
- e. Special attention shall be given for the protection of pedestrians and, in particular, children going to and coming from school. Ingress and egress shall be maintained for all properties abutting the pipeline.
- f. The Contractor shall provide a traffic control plan to Engineer for approval showing traffic control signs, barrels, cones, traffic officers, including detour signs, meeting the approval of Engineer, Owner and local Police Departments in accordance with the Manual of Uniform Traffic Control Devices.
- g. The Contractor shall notify the State and local police, ambulance services and fire departments of daily traffic diversions. Contractor shall have no claim of delay if he does not notify the Police Department of his scheduled location in time to arrange for traffic officers.
- h. The Owner or Engineer make no warranty or representation that the Contractor will be permitted to divert or barricade traffic and the Contractor shall be fully responsible to complete all obligations of the Contract regardless of any restrictions which may be imposed by Federal, State or local authorities.

1.02 <u>MAINTAINING TRAFFIC</u>

- a. Traffic Diversion
 - 1. Whenever it is necessary to divert traffic from its normal channel into another channel, such diversion shall be clearly marked by cones, drums, barricades or temporary guard rail. If the markers are left in place at night, suitable lights shall be provided and maintained.
- b. One Way Traffic
 - 1. Whenever one-way traffic is established, at least one (1) police officer shall be provided.
- c. Street Closing
 - 1. When permitted by Federal, State or local authorities having jurisdiction, the Contractor may close streets to through traffic for minimum periods of time. Contractor must notify and secure the permission of the local police and fire departments and such other public authorities and, if required by any law, ordinance or regulation, the occupants of all premises bordering the streets. Contractor must give all occupants reasonable notice with respect to the closing of any street, in whole or in part, even when not required by any law, ordinance, or regulation. Contractor shall so schedule his work that the time the street is closed is kept to a minimum and shall make suitable preparations for access by local residents, school buses, and mail delivery vehicles. Contractor shall provide access for police, fire, ambulance, school buses and emergency vehicles at all times. Fire hydrants and other public utility valves shall be kept accessible at all times by the Contractor.
 - 2. Contractor shall hand deliver written notice to individual houses affected by driveway and side road closings or detours a minimum 24 hours in advance. A recommended parking area outside the work limits shall be included in the notice.

1.03 TRAFFIC SIGNALS AND CONTROLS

- a. The installation and operation of all traffic signals and traffic control devices shall conform to the requirements of Federal, State and local government highway departments.
- b. To protect persons from injury and to avoid property damage, adequate barricades including flasher and reflectorized construction signs and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic and pedestrians to use the trenched area.
- c. When the Contractor is permitted to close a street or road to traffic, the Contractor shall furnish, erect, maintain and remove barricades, suitable and sufficient red lights, and other lights or reflecting material at the limits of the project, where side streets intersect, and at other points of public access to the project. The Contractor shall furnish, erect and maintain advance warning signs and barricades on side streets at the first street intersection beyond the

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one closed by construction indicating Street Closed, One Block Ahead. The Contractor shall furnish, erect, maintain and remove detour marking signs on temporary routes.

- d. If work is not yet completed for a particular section of roadway and traffic will be allowed to flow until work commences again, all signs which temporarily do not apply must be bagged, removed or positioned in such a manner so as not to be seen by motorists.
- e. All signs that are no longer actively in use should be removed immediately.

1.04 TRENCH AND STORED MATERIAL MARKINGS

- a. Before completion of each day's work the pipe trench shall be completely backfilled and compacted. All trenches must be graveled at the surface. Trench boxes and steel plates must be buried a minimum of one foot beneath the road surface. These areas are not to be left open, impassable or unsafe through the night. In the event that the pipe trench cannot be completely backfilled and compacted, temporary bridges and crossings shall be used to accommodate through traffic and the general public. The job site will be left in a neat and satisfactory condition at the end of each day. The requirements of this Section are in addition to any requirements of Federal, State or local laws, rules, regulations or ordinances or any requirements found elsewhere in the Contract Documents.
- b. Equipment and material stored on the street shall be marked at all times. At night any such material or equipment stored between the side ditches, or between lines 5 feet behind any raised curbs, shall be clearly outlined with light or other dependable warning devices that are approved by the Engineer. In addition, the Contractor shall provide any other lights, barricades, etc., that may be needed for the protection of pedestrian traffic. Should any police or municipal requirements dictate that equipment and material cannot be stored along a roadway, the Contractor shall relocate his equipment or material at no additional cost to the owner.

1.05 OTHER REQUIREMENTS

- a. If the regulation of traffic and controls are not being provided in accordance with this section, and the public is inconvenienced or its safety is being endangered, in the judgement of the Engineer, the Owner may take such steps as it deems advisable to provide such services and all costs in providing such services will be deducted from any payment which may be due or may thereafter become due to the Contractor. Owner will deduct from monies due Contractor for the following abnormal and unreasonable expenses:
 - 1. Contractor caused delays in the execution of work that result in hiring traffic officers for more hours than would have been required during normal execution of work.
 - 2. Reconstruction and/or reinstallation of any portions of the work, as a result of improper initial installation or defective material, for which traffic officers are required.

- 3. Traffic officers required at a site where Contractor is not working or outside of Contractor's standard work day as a result of obstructions to traffic that remain in the traveled way.
- 4. All other incidents resulting from Contractor's operations requiring traffic officers that would not normally be encountered during the progress of a well-organized project employing proper construction methods.
- 5. When traffic officers are requested for the convenience of Contractor and are not otherwise considered necessary to the work.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

SECTION 01560 TEMPORARY CONTROLS

PART 1: <u>GENERAL</u>

1.01 <u>SCOPE OF WORK</u>

- a. Section includes:
 - 1. Dust Control
 - 2. Noise Control
 - 3. Air, Water Pollution, and Solid Waste Control
 - 4. Filer Fabric

1.02 <u>SUBMITTALS</u>

a. Materials proposed for filter fabric.

PART 2: PRODUCTS

2.01 FILTER FABRIC

a. Filter fabric siltation fencing shall be a woven filter fabric having a weight of at least 2.5 ounces per square yard, a thickness of at least 17 mils, a coefficient of permeability of not less than 0.0009 centimeters per second and allows a water flow rate of a minimum 40 gallons per minute per square yard. The material shall have a high sediment filtration capacity, high slurry flow and minimum clogging characteristics. The material shall be equal to 100x as manufactured by Mirafi, Inc., Charlotte, North Carolina; Amoco 2130 by Nilex, Inc., Centennial, CO; MISF 180 by Mutual Industries, PA; or equal.

PART 3: EXECUTION

3.01 DUST CONTROL

- a. The Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation and dispersion of dust.
- b. The Contractor shall sweep and sprinkle streets with water as necessary and shall furnish and apply suitable and permitted chemicals as required to control dust in unpaved streets, trench areas or excavation areas.
- c. If, in the opinion of the Engineer, the Contractor is not maintaining adequate dust control, the Engineer will notify the Contractor, who shall promptly provide whatever methods and means are necessary to bring the dust under control.

3.02 NOISE CONTROL

d. The Contractor shall take effective measures to minimize noise produced by all construction operations, including the use of properly maintained and operating exhaust mufflers on his construction vehicles, whether used on-site or off-site.

e. The number of machines in operation at a given time must be limited to the minimum practicable. All engine generators or pumps must have mufflers and be enclosed within a temporary structure.

3.03 AIR, WATER POLLUTION, AND SOLID WASTE CONTROL

- a. The Contractor shall make himself aware of and shall comply with all current local, State and Federal regulations governing air and water pollution control and solid waste control, including especially, regulations prohibiting open burning of trees, logs, stumps, brush, vegetation and construction debris.
- b. Wood chips resulting from the use of mechanical brush and log chippers shall be removed and disposed of at approved off-site locations. In no case shall any logs, trees, brush, vegetation, wood chips or construction debris be buried on site. All such materials shall be immediately removed and disposed of at off-site locations.
- c. The Contractor shall take particular note of protective measures required for construction vehicles leaving site.
- d. Excavated material not approved by the Engineer for fill use is not to be used in backfilling or for any other new fill and must be removed from the site. All such material as well as excess earth or refuse, is to be transported to approved solid waste disposal areas by certified haulers and dumped there. All hauling, dumping and other charges are to be paid by the Contractor in accordance with Section 02120, Soil Disposal.
- e. All registrations, permits, and certifications required by the responsible authorities are to be obtained and paid for by the Contractor.
- f. The discharge of water collected from dewatering operations may fall under this jurisdiction and requirements of governmental agencies. The Contractor must comply with any requirements imposed by such agencies, such as pretreatment of waters before discharge or any other conditions. The Contractor alone is to bear all costs of such compliance.

3.04 FILTER FABRIC

a. Install filter fabric as shown on the Drawings

SECTION 01580 PROJECT SIGNAGE

PART 1: GENERAL

1.01 WORK INCLUDED

a. The Contractor shall furnish all labor, equipment, materials and means necessary to provide and maintain facilities required by the engineer and regulatory agencies for the project. The cost for all equipment and services provided under this section shall be included in the bid price and no additional payments will be considered by the Owner.

1.02 <u>SUBMITTALS</u>

a. Submit layout sketch of project sign to the Engineer for approval prior to fabrication.

PART 2: <u>PRODUCTS</u>

2.01 PROJECT SIGN

The Contractor is to provide, erect, maintain and remove, at completion of the Project, an approved project sign. The sign shall be $8'-0'' \ge 4'-0''$ in size. The sign is to be in accordance with the following requirements:

- a. EPA Logo accompanied with a statement indicating that the recipient received financial assistance from EPA for the Project.
- b. MassDEP Funding Agency Logo and notation in accordance with funding agency standards.
- c. Name of Town, Project, and Contract number.
- d. Project Cost
- e. Name of Owner
- f. Name of Consulting Engineer
- g. Name and address of Contractor
- h. Contact telephone number

PART 3: EXECUTION

The project sign is to be mounted between common redwood uprights and shall be fabricated, erected and maintained by the Contractor in accordance with the following specifications:

- a. Sign Panel: The sign panel is to be constructed of 3/4" minimum thickness marine plywood rabbeted into a 1 1/4" x 4" redwood frame. All fasteners used in the construction of the sign are to be of aluminum or galvanized steel.
- b. Panel Face:

Background - The sign face background is to consist of at least two coats of white paint. Lettering - Use black paint for all lettering except as otherwise designated.

Emblem - The emblem is to be of the types and sizes provided by the regulatory agencies and placed on the sign as directed by the Engineer.

- c. Painting: All supports, trim and the backs of the sign panels are to be painted with at least two coats of the same white paint used for the sign faces. All paint is to be exterior grade paint, suitable for use on wood signs.
- d. Location: The sign is to be located in a prominent position as determined by the Owner and Engineer.
- e. Sign Supports: Adequate support for the project sign, as determined by the Engineer, is to be provided by the Contractor. Adequate support is to include the positioning and alignment of the sign as determined by the Owner and Engineer.
- f. Maintenance: The project sign is to be maintained by the Contractor in good condition at all times for the duration of construction.
- g. Removal of Sign from the Project Site: The Contractor is to remove the project sign from the construction site at the completion of construction and when ordered by the Engineer.
- h. Payment: The cost of the fabrication, erection, maintenance and removal of the project sign, including all labor and materials, is to be included in the Contractor's total bid. No separate payment will be made for the project sign.

SECTION 01600 PRODUCT REQUIREMENTS

PART 1: GENERAL

1.01 PROTECTION OF MATERIAL AND EQUIPMENT

- a. The Contractor shall be responsible for the safe storage of all material furnished to or by him until it has been incorporated in the completed project and accepted by the Engineer. The Contractor shall bear the risk of loss and/or damage to the materials and Work until the Work is finally accepted by the Engineer.
- All electrical and mechanical equipment shall be stored in a warm, dry shelter with proper ventilation. Under no circumstances shall motors, electrical control equipment or any other electrical or mechanical equipment be stored under polyethylene plastic covers or tarpaulins. When space is available inside existing structures, and the Owner approves, the Contractor will be allowed to store equipment inside them. Should such space not be available, the Contractor shall construct a shelter with a source of heat and proper ventilation as approved by the Engineer for the storage of equipment.
- c. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.
- d. After valves and hydrants have been inspected, the Contractor shall properly store them prior to use. In order to prevent entry of foreign material that could cause damage to the seating surfaces, the valves and hydrants shall be stored in a fully closed position unless recommended otherwise by the manufacturer. Resilient seated valves shall be stored in accordance with the manufacturer's recommendations. This may include storage with protective covers for rubber seats and in a marginally open condition. Valves and hydrants should be stored indoors.
- e. If valves must be stored outdoors, the Contractor shall protect the operating mechanism, such as gears, motor, actuators and cylinders, from weather elements. Valve ports and flanges must be protected from the weather and foreign materials. If valves are subject to freezing temperatures, all water must be removed from the valve interior and the valve closed tightly before storage, unless specifically recommended otherwise by the manufacturer. Failure to do so may result in a cracked valve casting. Valves shall be stored on pallets with the discs in a vertical position to prevent rainwater from accumulating on top of the disc, seeping into the valve body cavity and freezing and cracking the casting.

1.02 SERVICING EQUIPMENT

a. The Contractor shall check all equipment upon acceptance to determine if oil reservoirs are full and areas to be greased are properly packed with grease. The Contractor will provide the proper grease or oil for use in lubricating the required areas in the equipment. Any service to equipment while in storage, or installed pending acceptance, is the responsibility of the Contractor and shall be performed per manufacturer's requirements, industry standards or as stated specifically in the technical specifications.

PART 2: PRODUCTS

2.01 <u>GENERAL</u>

- a. Unless otherwise specifically provided for in these specifications, all equipment, materials and articles incorporated in the Work shall be new, in current production and the best grade obtainable consistent with general construction usage.
- b. Materials specified by reference to the number or symbol of a specific standard, such as a Commercial Standard, Federal Specification or other similar standard, shall comply with the supplement in effect on the date of the Specifications, except as limited to type, class or grade, or modified by these Specifications.
- c. The Contractor shall submit to Engineer samples of materials for approval when requested and/or directed.

PART 3: EXECUTION

3.01 <u>COORDINATION OF DIMENSIONS</u>

a. The Contractor shall verify and make necessary corrections to construction dimensions so all specified materials can be installed and will function within the intent of the Contract Drawings and Specifications. The Contractor will promptly notify the Engineer of all necessary corrections required.

3.02 <u>SAFETY AND HEALTH REQUIREMENTS</u>

a. All material, equipment, fixtures and devices furnished shall comply with the requirements and standards of all Federal, State and local laws, ordinances and codes governing safety and health.

3.03 <u>RESPONSIBILITY FOR MATERIAL AND EQUIPMENT</u>

- a. When received from the Carrier and at time of unloading, the Contractor shall inspect all pipe and accessories for loss or damage. No shipment of material shall be accepted by the Contractor unless loss or damage has been described on the Bill of Lading by the Carrier's agent. Any discrepancies between the Bill of Lading and the physical material shall be noted on the Bill of Lading. All demurrage charges on carloads or truckloads of pipe or other material shall be paid by the Contractor.
- b. The Contractor shall be responsible for all material furnished by him. All such material which is defective in manufacture or has been damaged in transit or has been damaged after delivery shall be replaced by the Contractor at his expense.
- c. The Contractor's responsibility for material furnished by the Owner shall begin upon Contractor's acceptance at the point of delivery to him. All such material shall be examined, and material defective in manufacture and/or otherwise damaged shall be rejected by the Contractor at the time and place of delivery to him and replaced by the Owner. Once

Accepted by the Contractor, at the point of delivery to him, all defective and/or damaged material discovered prior to final acceptance of the Work shall be removed by the Contractor and he shall install, at his own expense, the material replaced. In such case the Contractor shall furnish all labor, equipment and material incidental to replacement and necessary for the completion of the Work to the satisfaction of the Engineer. The Contractor will be reimbursed for the cost of replacing defective materials furnished by the Owner and accepted by the Contractor if, but only if, the Contractor submits proof satisfactory to the Engineer and to the manufacturer and/or supplier from whom the Owner purchased the material that the defect was latent and could not have been discovered by the Contractor.

3.04 <u>PIPE DELIVERY AND STORAGE</u>

- a. The Contractor shall be responsible for unloading, stringing and/or storing pipe and fittings delivered to the job site. In addition, the Contractor shall inspect the delivered materials as specified in Section 01600.3.03.
- b. The Contractor is cautioned that storage space along the route of the pipeline is limited. It may not be possible for pipe and fittings to be strung along the pipeline route. The Contractor shall make his own investigations and estimations as to the quantity of storage area available along the pipeline route. The Contractor shall provide storage yards as required to accept the pipe and fittings delivered to the job site. The Contractor shall make his own arrangements relative to obtaining storage areas.

3.05 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- a. The Contractor shall arrange for a qualified service representative from each company, manufacturing or supplying certain equipment as required by the individual Specification Sections to perform the duties herein described.
- b. After installation of the applicable equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include but shall not be limited to, the following points as applicable:
 - 1. Soundness (without cracked or otherwise damaged parts)
 - 2. Completeness in all details, as specified
 - 3. Correctness of setting, alignment, and relative arrangement of various parts
 - 4. Adequacy and correctness of packing, sealing and lubricants
- c. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.
- d. On completion of his work, the manufacturer's or supplier's representative shall submit to the Engineer a complete signed report of the result of his inspection, operation, adjustments, and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained is such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Contract Documents and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

e. After the Engineer has reviewed the reports from the manufacturer's representatives, the Contractor shall make the arrangements to have the manufacturers' representatives present when the mechanical performance tests are made.

SECTION 01630 PRODUCT SUBSTITUTION DURING CONSTRUCTION

PART 1: GENERAL

1.01 <u>SUMMARY</u>

- a. In order to establish standards of quality, the Engineer, in the Project Manual, may have referred to certain "Brand Name" products by name and/or catalog number. This procedure is not to be construed as eliminating from competition other products of equivalent or better quality by other suppliers or manufacturers where fully suitable in design and manufacture.
- b. The Contractor's bid must be based upon the materials and equipment named in the Project Manual, or materials and equipment of equivalent quality and effectiveness. The first named supplier shall be considered as the standard of reference, for the Engineers design and for the equivalency determination to be made by the Engineer.

1.02 MATERIALS OR EQUIPMENT: SUBSTITUTES AND OR-EQUALS

- a. The following provisions shall apply to the furnishing of materials or equipment that are substitutes for or that are to be considered as equals to those called for in the Project Manual.
- b. As used herein, a "substitute" material or equipment refers to a difference between what the Engineer designed and what the Contractor proposes to provide such that some design change or other accommodation would be required. A substitute would include, but not be limited to, materials or equipment that accomplish the same goal as the specified materials or equipment, but may have different size, shape, electrical characteristics, or structural or mechanical requirements, and, therefore, would require possible redesign by the Engineer, or possible changes in construction.
- c. As used herein, an "or-equal" material or equipment refers to materials or equipment that are essentially the same as those which were specified, but come from a different manufacturer, and may therefore have minor differences but do not require any redesign, or construction changes to accommodate.
- d. It shall be the responsibility of the Contractor to ensure that materials and equipment to be furnished, including any substitute or any or-equal materials or equipment, fit the space available. The Contractor shall make necessary measurements to ascertain space requirements, including those for connections. All redesign and other additional costs incurred by the Owner as a result of the Contractor's furnishing substitute or or-equal materials or equipment shall be borne by the Contractor.
- e. All materials and equipment must be new unless expressly stated otherwise in the Contract Documents.
- f. The Contractor is responsible for providing documentation for review by the Engineer of any proposed substitute materials or equipment and any proposed or-equal materials or equipment so as to enable the Engineer to determine if the proposed materials or equipment are acceptable. For any proposed substitute materials or equipment, the Engineer will record

the time required to evaluate the Contractor's proposals for any substitutions for items named in the Project Manual and in making changes in the Contract Documents occasioned thereby.

- g. Whether or not the Engineer accepts a proposed substitute, the Contractor shall reimburse the Owner for the charges of the Engineer for evaluating any proposed substitution for named items. All redesign and other additional costs incurred by the Owner as a result of the Contractor's furnishing substitute materials or equipment shall be borne by the Contractor. The Owner shall bear the cost of reviewing "or-equal" materials and equipment.
- h. Following review and written acceptance by the Engineer and Owner, the Contractor may proceed with providing the substitute materials and equipment, or the or-equal materials and equipment, as the case may be.

1.03 OR-EQUAL MATERIALS AND EQUIPMENT

- a. Following execution of the Contract with the successful bidder, the Contractor may then submit to the Engineer for consideration the use of materials and equipment which the Contractor believes to be equivalent to or better than those specified. Requests for review of equivalent items of material and equipment will not be accepted by the Engineer from anyone other than the Contractor.
- b. To be considered an equivalent, the materials and equipment must be shown by the Contractor to meet all requirements; be of similar type, function and quality; be cost effective, as compared to the materials and equipment named, in all respects, including first costs, operating costs and maintenance costs; and must perform satisfactorily.

1.04 <u>SUBSTITUTION OF MATERIALS AND EQUIPMENT</u>

- a. Requests for review of substitute items of material and equipment will not be accepted by the Engineer from anyone other than the Contractor. If the Contractor wishes to furnish or use a substitute item of material or equipment, the Contractor shall make a written application to the Engineer for acceptance thereof, certifying that the proposed substitute will be similar and of equal or better substance and quality to that specified, will be suited to the same use and will perform properly the same functions as that specified. The Engineer will consider written requests from the Contractor for substitutions within 30 days after the Notice to Proceed. After this period, requests will be considered only in case of unavailability of product or other conditions beyond control of the Contractor. Approval of a substitution does not relieve the Contractor from the requirement for submission of Shop Drawings as set forth in the Contract Documents.
- b. The application shall state whether acceptance of the substitute for use in the work will require a change in the Contract Documents to adapt the design to the substitute and whether incorporation or use of the substitute in connection with the work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified shall be identified in the application and available warranties, maintenance, repair and replacement service shall be indicated. The application shall also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such a substitute, including costs of redesign, all of which shall be considered by the Engineer in evaluating the proposed substitute. Provide the following with each substitution request:

For products or Suppliers:

- 1. Product identification, including Supplier & manufacturer's name and address.
- 2. Manufacturer's literature with product description, performance and test data, and reference standards.
- 3. Samples, if appropriate.
- 4. Name and address of similar projects on which product was used, and date of installation.

For construction methods (if specified):

- 1. Detailed description of proposed method.
- 2. Drawings illustrating method.
- c. The Engineer may require the Contractor to furnish at the Contractor's expense, additional data about the proposed substitute including without limitations the anticipated reduction of the Contract Price. The Engineer will be the sole judge of acceptability and no substitute will be ordered or installed without the Engineer's prior written acceptance. The Owner may require the Contractor to furnish, at the Contractor's expense, a special performance guarantee or other surety with respect to any substitute.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

SECTION 01720 FIELD ENGINEERING

PART 1: <u>GENERAL</u>

1.01 METHOD OF CONSTRUCTION

a. Before starting the work, and from time to time during its progress as the Engineer may request, the Contractor shall outline to the Engineer the methods he plans to use in performing the work and the various steps he intends to take. Contractor shall maintain a complete, accurate log of control and survey work as it progresses. Contractor shall establish lines, benchmarks, and elevations required to layout and construct the Work

1.02 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

a. The Engineer may furnish the Contractor with additional instructions and detailed drawings as may, in the opinion of the Engineer, be required to clarify the work included in the Contract. The additional drawings and instructions, thus supplied to the Contractor, will be coordinated with the Contract Documents and will be so prepared that they can be reasonably interpreted as a part thereof. The Contractor shall carry out the work in accordance with any additional detailed drawings and instructions. Additional instructions and detail drawings are not to be considered extra work.

1.03 <u>PIPE LOCATION</u>

a. All new pipe lines are to be located substantially as indicated on the drawings, but the right is reserved to make such modifications in their location as may be found desirable to avoid interference with existing structures or for other sound reasons. Where fittings or accessories are noted on the drawings, such notation is for the Contractor's convenience and does not relieve him from laying and joining different or additional fittings where required to place pipe in proper position, without additional compensation. Where existing underground utilities are encountered which were not anticipated or indicated, the Contractor shall request from the Engineer such instructions as may be necessary to properly install new piping to eliminate the interference.

1.04 CHANGES IN DESIGN

a. If, during construction, it is found expedient by the Contractor to modify or change the design of any part of the facility, including the equipment or any part thereof, completely detailed and checked working drawings showing the proposed changes shall be submitted to the Engineer for his review. Any permitted modification or change of design as set forth above is to be at the sole discretion of the Engineer. Approval of such changes does not release the Contractor from his obligation or guarantees, nor are any of the conditions of the Contract abrogated thereby. Any additional costs, including redesign costs to this Contract resulting from these changes, are to be borne by the Contractor.

PART 2: <u>PRODUCTS</u>

Not Used.

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PART 3: EXECUTION

3.01 <u>PROCEDURES</u>

- a. Contractor provided Registered Professional Engineer or Land Surveyor shall establish and maintain lines, elevations and reference marks needed during the progress of the Work and shall re-establish stakes and marks placed by the Engineer that are lost or destroyed through the course of the Work. Verify such work by instrument or other appropriate means.
- b. Engineer should be permitted at all times to check the lines, elevations and reference marks, set by the Contractor, who shall correct any errors disclosed by such check. Such a check shall not be construed to be an approval of the Contractor's work and shall not relieve or diminish the responsibility of the Contractor for the accurate and satisfactory construction and completion of the entire Work.
- c. Make, check, and be responsible for measurements and dimensions necessary for the proper construction of and the prevention of misfittings in the Work.
- d. Furnish all protective stakes and temporary structures for marking and maintaining points and lines for the building of the Work and give the Engineer such facilities and materials for verifying said lines and points as he may require.
- e. Maintain and prepare final record drawings of field engineering layouts and as-built survey conducted after completion of the Work.

SECTION 01730 SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 <u>QUALITY</u>

- a. The Contractor is to provide all labor, materials and equipment required to complete demolition work.
- b. All demolition work is to be done in a neat manner, consistent with the best acceptable industry practices and with full protection of adjacent construction or areas during the entire period of demolition.
- c. Demolition work is to include the removal of permanent construction materials which are existing, and includes but is not limited to pavement, curbing, sidewalks, fencing, concrete, metal, masonry, tanks, pumping equipment, piping, or materials of like intent.
- d. Demolition work is to include the removal of existing materials which may interfere with the proper construction of new work regardless of whether noted on the Drawings, or specified. Demolition work is to also include the reinstallation of any items of work which may have to be removed on a temporary basis, prior to demolition operations, in order to allow for the proper construction of new work.
- e. Demolition work is to include the permanent removal of existing structures or portions thereof. Also included is the removal and disposal of piping and equipment, gates, piping and appurtenances, concrete pads, and all other existing items as noted on the plans and as required to complete the work.
- f. In general, demolition work is to include, but not be limited to the removal of any abandoned piping which will interfere with construction of proposed piping or structures.

1.02 GOVERNING STANDARDS

- a. All demolition and disposal work shall be in accordance with all rules, regulations and requirements of the MassDEP, Town of West Springfield, all other local, state and Federal agencies having jurisdiction.
- b. All local ordinances associated with demolition and disposal are to be complied with. Ordinances associated with noise or dust control related to demolition are to be complied with.
- c. The Contractor is to furnish and pay for all licenses and permits. He is to arrange for and make all inspections and tests required by the governing authorities and agencies having jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

a. The Contractor shall furnish the necessary materials and equipment to complete the work required by this Section. All materials and equipment shall conform to the requirements of the respective Section of this Specification.

PART 3 - EXECUTION

3.01 STANDARD REQUIREMENTS

- a. In general, demolition materials are not to be used as backfill, but are to be transported and disposed of in an approved off-site disposal area.
- b. Materials such as concrete or masonry will not be acceptable as backfill.
- c. Burning of demolished and/or removed materials is not permitted.
- d. The Contractor is to conduct demolition work and the disposal of debris in such a manner so as to ensure a minimum interference with streets, walks, and other adjacent occupied structures. He is not to obstruct occupied or used facilities.
- e. Demolition work is to be undertaken to completion, irrespective of whether or not it is precisely defined as to limits and quantities. If such demolition is required in order to complete the intended new construction, it is to be undertaken completely and without dispute.
- f. The Contractor is to review the Drawings and Specifications to determine the extent of the work. The Contractor is specifically alerted to requirements for inspection of existing field conditions. The Contractor is to visit and inspect the project prior to preparing his bid in order to completely familiarize himself with all field conditions; the intent of the design, and the extent of all work. After his review and inspection is complete, and before he submits his bid, if the Contractor has any questions regarding the extent and details of the work under this section, he is to request, in writing, clarification from the Engineer.
- g. Before proceeding with any work, the Contractor is to confirm methods of construction, obtain all required field measurements, and verify all dimensions on the Drawings as required.
- h. Failure of the Contractor to familiarize himself with all drawings, relating to the work, and conditions existing at the site of construction, will not relieve him of his obligation to furnish all material and labor necessary to carry out the provisions of the contract documents and to complete the contemplated work for the consideration set forth in his bid.
- i. The Contractor is alerted to the fact that the Owner assumes no responsibility for actual conditions of the areas indicated to be demolished and/or abandoned.
- j. The Contractor is cautioned that the existing facilities are to be kept in operation during period of this Contract. The sequence of the Contractor's demolition and removal work is to be such so as to insure the uninterrupted operation of the Owner's facilities. In areas where the existing equipment must not be subjected to extremes of weather, the Contractor is to take all steps necessary to close and/or seal openings from adverse weather conditions.
- k. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner in so far as practicable.
- 1. Owner has first right of refusal for all materials demolished. If Owner does not elect to keep demolished materials, then all such materials demolished, removed and/or discarded are to become the property of the Contractor and are to be removed from the project site to an approved off site

location, unless instructions to the contrary are given to the Contractor either by Drawings or by Specifications.

- m. Storage or sale of demolished, removed, and/or discarded materials is not to be permitted on the site.
- n. The Contractor is to promptly repair all damages caused to adjacent existing facilities by demolition operations at no cost to the Owner. All adjacent areas and existing facilities are to be restored to at least the condition existing prior to the start of the work, unless the Drawings indicate otherwise.
- o. The use of explosives is not permitted.
- p. Masonry and concrete, intended to be removed, is to be removed in small sections.
- q. All new openings are to be neatly cut using a carborundum wheel or a saw blade producing clean and sharp edges. All new openings are to have their masonry sides patched, repaired and made ready to a condition proper for the installation of new work.
- r. The Contractor is to provide shoring, bracing or support to prevent movement, settlement or collapse of construction and/or work to be removed and adjacent facilities to remain.
- s. All demolition work is to be done in a neat manner, consistent with the best acceptable industry practices and with full protection of adjacent construction or areas during the period of demolition.
- t. All finish surfaces are to be workmanlike in appearance and uniform in color. Surfaces are to be straight, true and satisfactory to the Engineer.
- u. Upon completion of the demolition work, the Engineer will make an inspection of the work. No new work is to be started until the demolition work has been approved by the Engineer.
- v. All work is to be coordinated so that new work can begin immediately after the demolition work has been completed.
- w. The Contractor is to submit a schedule of proposed dates and proposed methods and operations for demolition and/or removal work to the Engineer for review prior to the start of the work. This schedule shall take into consideration the overall sequence of work with regard to phasing and maintain pump station operations. The method of demolition and/or removal is to be such as not to damage any portion of the work or building to be retained, or damage the structural integrity thereof. Included in this schedule is to be the coordination for shut-off, capping, and the discontinuation or continuation of utility services, and the methods to be used for all aspects of demolition and removal work.
- x. No demolition and/or removal work is to be undertaken until the schedules have been reviewed by the Engineer and the Owner.
- y. The Contractor is to proceed with all work in a systematic manner. The Contractor is to cut and remove all unwanted construction by methods least likely to damage adjacent work or work intended to be retained.

3.02 PROTECTION OF ADJACENT FACILITES

- a. All existing and new work is to be completely protected from damage and maintained satisfactorily during the Contractor's operations.
- b. The Contractor is to provide adequate protection of other work during his operations to prevent damage or detrimental effects which may arise from general exposure, adverse weather, adjacent construction operations, or activities at the work location.

- c. The Contractor is to execute demolition work so that adjacent property is protected against damages which might occur from falling debris or other causes. The Contractor is not to interfere with the use of adjacent buildings and is to maintain free and safe passage to and from such buildings.
- d. The Contractor is to take all precautions to guard against the movement, settlement or collapse of any sidewalks or street passages of adjoining property and is liable for any movement, settlement or collapse.

3.03 <u>REPAIR WORK</u>

- a. The Contractor is to promptly repair all damage done to the Owner's property or any other person, or persons on or off the premises by reason of his demolition work.
- b. The Contractor is to clean all adjacent structures and improvements of dust, dirt and debris caused by his demolition operations.
- c. The Contractor is not to store, or permit debris to accumulate on the site. If the Contractor fails to remove excess debris after more than 48 hours and after written notification by the Owner to the Contractor for said removal, the Owner reserves the right to cause such debris to be removed at the Contractor's expense. Costs incurred by the Owner are to be deducted from the payment to be made to the Contractor.
- d. In the course of the demolition work, where indicated the Contractor will be required to clean existing structures prior to backfilling. For the cleaning of structures, the Contractor shall hose down the walls and floor and remove all residual material such that the surfaces are clean and free of residuals, to the satisfaction of the engineer.
- e. Upon completing demolition work, the Contractor shall regrade the areas where existing facilities are to be demolished. The Contractor is to provide imported fill conforming to these specifications, if required, to backfill existing structures to be demolished. After demolition, the Contractor shall restore all areas and structures to be demolished in accordance with these specifications.
- f. The Contractor is alerted to the fact that some of the demolition work will involve work in confined spaces. The Contractor is responsible for complying with all OSHA and MassDEP requirements when conducting work in confined spaces.

3.04 <u>CLEAN-UP</u>

- a. The Contractor is to clean all adjacent structures and improvements of dust, dirt and debris caused by his demolition operations.
- b. The Contractor is not to store, or permit debris to accumulate on the site. If the Contractor fails to remove excess debris after more than 48 hours and after written notification by the Owner to the Contractor for said removal, the Owner reserves the right to cause such debris to be removed at the Contractor's expense. Costs incurred by the Owner are to be deducted from the payment to be made to the Contractor.

SECTION 01770 PROJECT CLOSEOUT

PART 1: GENERAL

1.01 <u>CLEANING UP</u>

a. The Contractor shall periodically, or as directed during the progress of the Work, remove and properly dispose of the resultant dirt and debris and keep the premises reasonably clear. Upon completion of the Work, he shall remove all temporary construction facilities and unused materials provided for the Work and put the premises in a neat and clean condition and do all cleaning required by the Specifications. Trash and combustible materials shall not be allowed to accumulate in construction locations.

1.02 GUARANTEES AND WARRANTIES

- a. The Contractor expressly warrants that all workmanship and materials performed or furnished under this Contract will conform to the Specifications, Drawings, samples and other applicable descriptions furnished or adopted by the Contractor and with all applicable laws, provisions and requirements of the Contract Documents. The Contractor shall remedy any defects due to faulty materials or workmanship which shall appear within a period of one year from the date of acceptance of the Work hereunder and pay for any damage to other Work resulting therefrom. The Owner shall give notice of observed defects with reasonable promptness. The Contractor's warranty hereunder is in addition to, and not in limitation of, any obligations found elsewhere in the Contract Documents, any special guarantees provided by the Contractor, and any obligations imposed by law.
- b. In addition to the above requirements, the Contractor shall assign material and equipment guarantees and warranties from all manufacturers and suppliers to the Owner and deliver copies of such guarantees and warranties and the assignments thereof to the Owner in order to assure the Owner of the full benefit of such guarantees and warranties.

1.03 <u>RESTORATION</u>

a. The Contractor shall restore and/or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surfaces and structures to a condition equal to that before the Work began and to the satisfaction of the Engineer and shall furnish all labor and materials incidental thereto. Temporary paving will be installed prior to the placement of permanent surfaces when required by the Engineer or by any federal, state or local governing body having jurisdiction over the site where the work is being performed. The Owner will be responsible for permanent paving.

1.04 MAINTENANCE OF SURFACES

a. Following the certification of completion by the Engineer, the Contractor shall, unless otherwise stipulated by the Engineer, maintain the surfaces of paved and unpaved trenches and adjacent curbs and gutters, sidewalks, fencing, sod and other disturbed surfaces for a period of one (1) year thereafter or as required by state, county or local authorities. All material and labor required for the maintenance of the trench surfaces and structures shall be

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1.05 <u>TESTING OF FACILITIES</u>

a. The Contractor shall produce a first-class job and all Work shall be tested under operating conditions and pressures and any leaks or malfunctions shall be repaired to the satisfaction of the Engineer at no additional expense to the Owner.

1.06 <u>CLOSEOUT PROCEDURES</u>

a. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection. Provide submittals to Engineer that are required by governing or other authorities. Submit Application for final payment identifying total adjusted Contract sum, previous payments, and sum remaining due. As specified in Article 15.06.A of Section 00700, General Conditions, provide evidence that all Work, materials and equipment will pass to Owner free and clear of any Liens or other title defects upon final payment. Such evidence may take the form of receipts or releases from all Subcontractors and Suppliers and an affidavit from Contractor as to the completeness of the receipts and releases as described in Section 00700 Article 15.06.A.3. Provide list of Subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.

1.07 FINAL CLEANING

a. Execute final cleaning prior to final inspection. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean debris from roofs, gutters, downspouts, and drainage systems. Clean site; sweep paved areas, rake clean landscape surfaces. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.08 PROJECT RECORD DOCUMENTS

- a. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - 1. Contract drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change orders and other modifications to the Contract
 - 5. Reviewed shop drawings, product data, and samples
- b. Store record documents separate from documents used for construction. Record information concurrent with construction progress.
- c. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number

- 2. Product substitutions or alternates utilized
- 3. Changes made by addenda and modifications
- d. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Take swing ties to all underground work from a minimum of three horizontal locations. Vertical dimensions to all below grade work shall also be obtained. Permanent surface reference points are manholes, catch basins, power poles, and above-grade structures.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Ties to all surface structures (including manholes, catch basins, vaults, valve boxes, hydrants, curb stops, cleanouts, wet wells, outlets, etc.) from two horizontal measurements to permanent surface reference points. Re-station surface structures if stationed on Drawings.
 - 5. Ties to other utility crossings, abandoned pipelines, and sewer service stubs, from two horizontal measurements to permanent surface reference points include depth below permanent grade and spacing between crossing utilities.
 - 6. Invert and rim elevation of all gravity pipelines and structures including manholes, catch basins, below-grade structures, wet wells, septic tanks and distribution boxes as appropriate.
 - 7. Field changes of material, dimension and detail.
 - 8. Details not on original Drawings.
- e. Submit documents to Engineer with final Application for Payment.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

- a. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.
- b. Deliver to project site and place in location as directed; obtain receipt prior to final payment.

1.10 FINAL PAYMENT

- a. Refer to Article 15.05 and 15.06 in Section 00700, General Conditions, for procedures relating to final inspection and payment.
- b. The Contract shall be considered complete and final payment made, only when:
 - 1. All provisions of the Contract Documents have been strictly adhered to.
 - 2. The project and premises have been left in good order, including removal of all temporary construction, Contractor-owned and extraneous materials.

SOIL DISPOSAL

PART 1: GENERAL

1.01 SCOPE OF WORK

a. The Contractor shall furnish all labor, materials, tools and equipment necessary to stockpile excavated materials, that are unsuitable to be used as fill material, and shall be responsible for any required handling, transportation and off-site disposal for the soil.

1.02 <u>SUBMITTALS</u>

a. <u>Statement of Qualifications</u>

At least 10 working days prior to performance of any soil disposal, the Contractor shall provide to the Engineer statement of qualifications for Waste Materials Management including names, addresses, and telephone numbers of responsible individuals (all subject to review of the Engineer before initiation of work).

Evidence of current valid permits, licenses, and certifications including, as a minimum, the following:

- 1. Valid off-site transportation and disposal permits and licenses from the waste hauler and DF.
- 2. Name, location, telephone number, ID Number, and all applicable permits of all facilities to be used for disposal.

1.03 <u>DELIVERABLES</u>

- a. Prior to disposal, the Contractor shall provide the Engineer a signed Indemnification and Hold Harmless clause for all non-contaminated soil disposed under this contract. The clause shall be signed by the receiving facility documenting that they release Town of West Springfield from liability for the soils.
- b. Prior to start of work, the Contractor shall provide documentation that the fill material used to backfill excavations is in compliance with local and state regulations. Comply with MassDEP's "Similar Soils Provision Guidance" if fill materials are imported from a regulated remediation site (identified as a 21E disposal site).
- c. Within 30 days of completion of waste disposal, provide documentation including as a minimum, the following:
 - 1. A copy of the Certified Weigh Tickets for each load of non-contaminated soil removed and transported from the site.
 - 2. Provide a copy of the Bill of Lading for each load of fill material brought onto the site documenting the source of the fill material.
- d. Provide any other documentation requested and required by the Engineer to conform or comply with all applicable laws, codes, ordinances, and regulations.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

3.01 EXCAVATION, STOCKPILING AND OFF-SITE DISPOSAL OF SOILS

- a. Excavated soils shall be properly stockpiled in a designated area. The Contractor shall retain disposal facilities and all stockpiled soil shall be removed from the site for disposal.
- b. The Contractor must provide signed receipts for the material and/or weight tickets to the Engineer which indicates the volume recycled or disposed by type of material, certificates of disposal and bills of lading, as applicable.
- c. The Contractor shall take every precaution, including but not necessarily limited to wheel washing, to prevent the off-site tracking of mud and soil. All full trucks must be covered by a tarp prior to exiting the site. No truck will be permitted to leave the site until it is logged out by the Engineer. In the event a truck leaves the site without the Engineer logging it, the Contractor shall not be paid for that load.
- d. The Contractor shall submit executed bill of ladings for each load of material removed from the site to the Engineer.
- e. Contaminated excavated soil shall not be used and shall be disposed in compliance with local and state regulations. Contractor shall refer to MassDEP Massachusetts Contingency Plan for contamination thresholds for the site conditions.

SECTION 02210 GROUND PENETRATING RADAR INVESTIGATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- a. Work shall include nondestructive location and marking of underground utilities for the Project coverage area, including public road right of ways in all areas where new utilities are proposed. This excludes the parcel of land owned by the Town between Piper Road and Apricot Hill Lane.
- b. Review all available documents to identify and mark out existing underground utilities and unknown anomalies.
- c. Review equipment capabilities and potential job-site performance impedances.
- d. Calibrate the equipment to the conditions at site. This calibration may be estimated, or a test performed to determine the correct dielectric of the soil using hyperbola matching or calibrating to an object at a known depth. Proof of calibration on all equipment used for scanning must be submitted to the Engineer prior to commencing field investigation.
- e. Place Dig Safe public utility markout request a minimum of 72 hours prior to mobilizing on site for the ground penetrating radar investigation.
- f. Perform a site walkthrough locating marked utilities through the Dig Safe markout requests after mobilizing to the site. Document all known utilities. Typical known utilities includes five primary utilities to any building: water, electric, gas, sanitary sewer, and communication lines. Additionally, all utilities identified on a drawing not on list, any that have been communicated verbally, and any utility for which a feature can be observed.

1.02 **DEFINITIONS**

- a. Utility location: The process of identifying and labeling public and private utility lines that are underground. These lines may include telecommunication electricity distribution, natural gas, cable television, fiber optics, traffic lights, streetlights, storm drains, water mains, and wastewater pipes.
- b. Ground Penetrating Radar (GPR): A geophysical method that uses pulses of electromagnetic wave energy to image the subsurface. Ground penetrating radar transmits energy in the microwave band of the of the electromagnetic spectrum.
- c. Electromagnetic Locator (EM): Also known as a pipe and cable locator, is used for tracing utility lines and metallic pipes, and clearing excavation and drilling locations. These utility locators consist of two main parts, a transmitter and a receiver

1.03 <u>REFERENCES</u>

a. Occupational Safety and Health Administration – Safety and Health Standards Digest Construction Industry (OSHA) – 3149/1996).

- b. American Society for Nondestructive Testing, (ASNT). The ASNT is the world's largest technical society for nondestructive testing (NDT) professionals. The society provides a forum for exchange of NDT technical information; NDT educational materials and programs; as well as standards and services for the qualification and certification of NDT personnel.
- c. ASNT Recommended Practice No. SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing. This Recommended Practice establishes the general framework for a qualification and certification program. In addition, the document provides the educational experience and training recommendations for different test methods including use and application of ground penetrating RADAR. This recommended practice is not intended to be used as a strict specification. It is recognized, however, that contracts require programs which meet the intent of this document. For such contracts, purchaser and supplier must agree upon acceptability of an employer's program.

1.04 <u>SUBMITTALS</u>

- a. Reports, geophysical survey investigation drawing(s) in CADD format, and GIS Shapefiles with a Google Earth overlay must be submitted to Engineer for review. The report shall:
 - 1. Explain scan findings, and identify areas where the technologies worked well and areas where results were inconclusive due to interference and or soil conditions.
 - 2. Explain markings and depth estimates.
 - 3. Identify any anomalies encountered during scanning.
 - 4. Provide any recommendations for follow up investigations such test pitting to confirm unknown anomalies and critical utilities.
- a. Prerequisite Qualifications:
 - 1. Submit resumes and any certifications of qualified staff to be involved with the scope of work.
 - 2. Field technicians shall maintain minimum OSHA requirements and any other applicable project specific training prior to performing field work.
 - 3. Staff must have all necessary scanning equipment and tools to complete the scope of work. GPR equipment shall include at minimum Ground Penetrating Radar System and Electromagnetic Locating Equipment (Pipe Locator).

PART 2 - PRODUCTS

2.01 <u>SUBSURFACE INVESTIGATION SERVICE PROVIDER</u>

- a. Provide services of one of the following subsurface investigation service providers:
 - 1. Radar Solutions International, Inc.
 - 2. Ground Penetrating Radar Systems LLC

3. Or Equal

PART 3 - EXECUTION

3.01 SUBSURFACE INVESTIGATIONS

- a. Perform scanning using GPR and Electromagnetic Locating Equipment.
- b. Collect scans with GPR parallel to any marked utility to confirm markouts and check for any laterals/T's.
- c. Collect GPR scans to locate unknown utilities.
- d. Scan all areas in a grid with spacing determined by site conditions.
- e. Collect GPR scans across all previously located utilities to confirm locations and approximate depths.
- f. Mark located underground utilities and features with paint, flags or other.
- g. Document any known utilities that could not be located.
- h. Document findings with photos and additional reporting/mapping, if required.
- i. All documentation as a result of the ground penetrating radar investigation will be provided to the Owner for review prior to the start of construction.

SECTION 02215 TEST PITS

PART 1 - GENERAL

1.01 WORK INCLUDED

- a. Work shall include the excavation of test pits to locate utilities and other critically indicated areas ahead of pipe laying. Test pits shall be located and performed where indicated on the Drawings or as directed by the Owner or Engineer. Expose the pipeline, and adjacent utilities, at each test pit location.
- b. All test pit locations shall be approved by the Owner or Engineer prior to the start of excavation.
- c. The Contractor during all phases of his work shall carefully protect all existing structure, pipelines, drains, conduits, or other improvements on the site, and shall restore same to a condition equivalent to conditions existing prior to his operations. Ample precautions shall be taken to prevent settlement of existing improvements.
- d. All existing pipelines and services shall be maintained or, where required, shall be removed and replaced to accommodate the work to be done under this Contract.
- e. A test pit shall be of sufficient size in a single excavation to expose and verify the existing utility information (utility pipe/conduit material, size, number or quantity, depth, vertical and horizontal alignment, fittings, orientation and all else witnessed or encountered) and for the Contractor to obtain the necessary measurements and information related to the utility(s) for preparation of a written report by the Contractor of the Contractor's findings for submission to the Engineer for review.
- f. The Contractor may, at his own discretion and with permission by the Owner, excavate additional test pits not ordered by the Owner or Engineer at his own cost. However, the Engineer shall be present during excavation of all test pits.
- g. Test pits shall include all labor, equipment and materials, including saw cutting of pavement, excavation, backfilling and compaction, and the furnishing and compaction of temporary pavement replacement within roadways in accordance with the paving requirements of Section 02740 and the Drawings.
- h. The Drawings indicate conditions as they are believed to exist based upon limited subsurface explorations. Investigations and field tests must be conducted to verify the conditions that exist which may affect the Work. All investigations must be conducted under the Engineer's observation.

1.02 <u>SUBMITTALS</u>

a. Should additional subsurface investigation be required, the Contractor shall submit for review by the Engineer a location plan showing the proposed location of all soil boring/test pit locations prior to the start of any work so that any potential conflicts with existing utilities may be resolved.

b. The Contractor shall submit a drawing and/or report for each test pit with all pertinent information including, but not limited to, location, depth and size of pipelines and utilities uncovered during the test pits.

PART 2 - <u>PRODUCTS</u>

2.01 <u>TEMPORARY PAVEMENT RESTORATION</u>

a. Each test pit within existing asphalt pavements shall be temporarily restored in accordance with the requirements of Section 02740.

2.02 BACKFILL MATERIALS

a. Backfill material shall be either select excavated material, imported bedding sand, or structural fill and shall meet the requirements of Section 02315.

PART 3 - <u>EXECUTION</u>

3.01 <u>REQUIRED TEST PITS</u>

- a. Test pits shall be required at the locations detailed on the Contract Drawings to verify the existing location and elevations of utilities. These test pits shall be conducted prior to the start of construction or unless otherwise herein specified.
- b. Other test pits may be required in addition to those noted on the Contract Drawings and exact locations shall be determined in the field.

3.02 EXCAVATION FOR TEST PITS

- a. Prior to test pitting operations, delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on non-paved surfaces and coordinate with the appropriate agencies in accordance MGL Chapter 82 Section 40. Pre-marking will not be acceptable if such marks can interfere with traffic or pedestrian control or are misleading to the general public. Pre-marking will not be required of any continuous excavation that is over 500 feet in length.
- b. Excavation for test pits shall be by machines with bottom 2 feet of the test pit (or in close proximity to known or anticipated utilities) by hand methods. Extreme caution shall be taken when digging around existing utilities. The Owner's representative and representatives from the differing utilities must be present at all times during excavation around their pipelines/structures. The Contractor shall include all costs for coordination of the inspection by the appropriate representatives within his unit price bid under the test pit item.
- c. Provide the Engineer with 24-hour notice prior to commencement of subsurface investigations.
- d. All excavation around, near or within close proximity to utilities shall be completed in accordance with all standards and requirement of the utility Owner. The Contractor shall be responsible to contact the utility Owner of all potential utilities within the area of the test pit location to ascertain any all proper procedures, standards, requirements and/or special conditions

for excavation, trench protection, backfill and restoration required by the applicably utility Owner at no additional expense to the Owner.

- e. All subsurface investigations shall be conducted in accordance 29 CFR Part 1926 Subpart P OSHA Excavation Regulations 1926.650 through 1926.652 including Appendices A through F.
- f. After observation by the Engineer, backfill and compact the test pits in accordance with Section 02315.
- g. Borings or other drilled probes shall be filled in their entirety with grout upon completion.
- h. Repair damage to any structure, utility, or private or public property or Site feature damaged during the Work to the satisfaction of the Engineer.
- i. Repair paved surfaces in accordance with Section 02740.
- j. Repair lawn areas or grass surfaces in accordance with 02900.

SECTION 02230 CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

- a) The Contractor shall complete all clearing, grubbing, soil stripping and all other related site clearing measures to the finished grades as detailed on the Contract Drawings and specified herein or elsewhere in the Specifications and as required to fulfill the intent of the Contract Drawings and Specifications.
- b) The Contractor during all phases of his work shall carefully protect all existing structure, pipelines, drains, conduits, or other improvements on the site, and shall restore same to a condition equivalent to conditions existing prior to his operations. Ample precautions shall be taken to prevent settlement of existing improvements.
- c) All existing pipelines and services shall be maintained or, where required, shall be removed and replaced to accommodate the work to be done under this Contract.

1.02 <u>SUBMITTALS</u>

- a) The Contractor shall submit a clearing plan and limit of disturbance for the approval of the Engineer.
- b) The Contractor shall submit to the Engineer for approval a plan showing his proposed haul and access roads, stockpile and storage areas. This plan should concur with the access roads, stockpile and storage areas depicted on the Contract Drawings.

1.03 <u>RELATED WORK</u>

a) Section 02215 – Test Pits

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 <u>CLEARING AND GRUBBING OF THE SITE</u>

- a) Prior to the start of any work, a pre-construction conference shall be held between the Engineer, Property Owner, Contractor, and representative of the West Springfield Local Conservation Commission (LCC).
- b) Erosion and sediment control devices as depicted on the plan shall be installed prior to start of work or pre-construction meeting with the LCC. In addition, a construction sequence plan must be submitted to the LCC prior to the pre-construction meeting.

- c) All trees, shrubs, logs, stumps, brush, vegetation, rubbish, and other materials which occupy the existing grades within the construction area shall be cleared and removed from the site, except for those trees which are specifically designated for protection at the site by the Engineer. Each such tree shall be protected to the drip line during construction with snow fencing. Care shall be exercised to avoid injury to roots or branches of any trees which are to remain. Where practical, common native trees and shrubs, of one through three-inch caliper, which must be cleared from the construction area shall be stockpiled for use in restoration. Otherwise, the disposal of materials so removed shall be at approved locations outside of the property.
- d) Only those portions of the construction area which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the construction site for future use.
- e) The length of time of ground disturbance shall be reduced to the minimum practicable. In environmentally critical areas, such as wetlands or wetland buffers, all disturbances must be completed and restored as promptly as possible. Best management practices shall be incorporated to minimize erosion. In wetland or wetland buffer areas, the Contractor shall comply with all permitting requirements. Ground disturbance shall be avoided until immediately preceding construction. Clearing, grubbing, and site grading shall be scheduled to avoid periods of heavy rainfall and periods of high surface water. Erosion and sediment controls shall be inspected after every rainfall to assure that maximum control has been provided.
- f) In heavily wooded areas, the Contractor shall make every effort to avoid the destruction of common native trees and shrubs so as not to unduly disturb the ecological balance or environmental quality of the area. Trees of 12-inch diameter or greater should be preserved whenever possible. Trees to be preserved shall be protected to the drip-line. Trees which must be pruned shall be cut cleanly and painted with tree paint. If a tree not intended to be removed is damaged, the wood shall be repaired according to common nursery practice and painted with tree paint. Straggling roots shall be pruned.

3.02 <u>TEMPORARY HAUL AND ACCESS ROADS, STOCKPILE AND STORAGE AREAS</u>

- a) Utilization of existing roadways and landscaped areas at the site shall be avoided as much as possible in locating these facilities. At the conclusion of their use, all temporary roads and storage areas shall be graded and restored to original conditions or incorporated into the final work as is applicable.
- b) Only environmentally suitable stockpile sites shall be used for the purpose of storing materials, equipment and spoils. Environmentally suitable sites shall be level and devoid of mature stands of natural vegetation. Drainage facilities and features, wetlands and stream corridors are not environmentally suitable sites.
- c) The boundary of the stockpile areas shall be clearly marked by hay bales, silt fencing or another approximate method. Where fill is to be stored in excess of 14 days, a suitable means of protecting excavated material from wind and water erosion shall be employed. Erosion control methods may include one or more of the following: mulching, sprinkling, silt fencing, hay baling and stone covering.

- d) The Contractor is cautioned that storage space at the project site and along the pipeline alignment is limited. Before starting construction, the Contractor shall make all necessary arrangements for off site storage areas needed for temporary storage of materials and equipment as may be required by his work. The cost of such storage facilities is included under the price bid and no additional payment will be made by the Owner thereof.
- e) The Contractor is permitted to use private property for access and storage, conditioned upon submittal of written proof from the property owner that use of the site is authorized. Any written authorizations shall be submitted to the Owner or Engineer a minimum of 48-hours prior to use of the private property.

3.03 STRIPPING OF TOPSOIL

- a) In unpaved areas, all topsoil shall be stripped and stockpiled and replaced in accordance with the appropriate Specification. No topsoil shall be removed from the job site, but shall be stockpiled in the vicinity of the area from which it is removed. Topsoil shall be replaced in the location and to the depth from which it was removed.
- b) Unacceptable excavated topsoil or excess topsoil shall be disposed of outside the property at approved off site locations in accordance with Section 02120, Soil Disposal, at no additional cost to the Owner.

3.04 STRIPPING AND REPLACEMENT OF WETLAND SOILS

- a) The Contractor shall adhere to all conditions imposed by the issuing authority, the West Springfield Local Conservation Commission (LCC), with regards to protection of environmental resource areas. Conditions may include limitations on the scope and location of work in the buffer zone as necessary to avoid alteration of resource areas. The LCC may require erosion and sedimentation controls during construction, a clear limit of work, and the preservation of natural vegetation adjacent to the resource area and/or other measures commensurate with the scope and location of the work within the buffer zone.
- b) Prior to the start of any work, the Contractor, site foreman, and/or construction manager and persons employed to perform earth moving activity shall submit a letter of understanding to the LCC stating that they have received, read, understand and shall comply with the wetlands Order of Conditions.
- c) Should the Contractor have knowledge of or become aware of the occurrence or presence of any condition or event that would constitute a violation of the Wetlands Protection Act, its regulations or of those conditions, that person shall inform the Engineer of such condition or event prior to any remediation effort or actions.
- d) The Contractor shall restore disturbed wetlands and wetland transition areas in accordance with the requirements of the Wetlands Order of Conditions and to the preexisting condition wherever feasible as further described herein.
- e) The work shall include:
 - 1. Preserving wetland areas to the maximum extent possible;

- 2. Removal, protection and storage of trees, saplings and shrubs affected by construction activities;
- 3. Topsoiling disturbed wetland areas with original soil material or suitable within 18-inch of the surface;
- 4. Seeding, mulching and erosion protection matting;
- f) The Contractor shall clearly flag and/or stake all limits of the wetland areas to remain undisturbed prior to the commencement of the site disturbance. In no case shall this limit of disturbance exceed the temporary construction easements or limit of disturbance boundary as shown on the Drawings.
- g) Any material placed in any wetland or other resource area without specific authorization under the Order of Conditions shall be removed immediately upon demand of the Engineer, Environmental Consultant, or LCC. Activities prohibited within any resource area or its buffer zone except as authorized in the approved plans:
 - 1. Operation of equipment, storage of materials, stockpiling or soil, or other site disturbance;
 - 2. Stockpiling of debris, aggregate, fill, excavated material, construction material and building material; it shall also be stockpiled far enough away to prevent sediment from entering any wetland resource area;
 - 3. Burying or disposal of debris or any other materials, other than that fill which may be allowed by the Order of Conditions and as shown on the approved plans;
 - 4. Underground storage of fuel or other hazardous substances;
 - 5. Dumping of leaves, grass clippings, brush, stumps, construction and yard debris or materials of any kind, unless expressly permitted by the Order of Conditions and the approved plans;
 - 6. Refueling, servicing, and repair of motorized construction vehicles. Equipment operators shall be prepared to immediately respond to accidental releases of fuel, motor oil, and other liquids through containment. If any release of fuel, motor oil, lubricating oils, etc. occurs, the Contractor shall immediately notify the concerned authority per the notification requirements in the Order of Conditions.
- h) All sedimentation structures shall be inspected and maintained on a regular basis by the Contractor until permanent vegetative erosion protection is established.
- i) No material or debris stockpile shall be located within 50-feet of the established wetland boundary. The base of all stockpiles shall be protected by a hay bale barrier or silt fence to contain sediment runoff.
- j) All excavated areas in the wetlands or wetland buffers shall be backfilled with the original soil material or suitable equal within 18-inches of the surface. A suitable equal material shall:
- 1. Be friable and loamy;
- 2. Be free of debris, objectionable weeds and stones;
- 3. Contain no toxic substances that may be harmful to plant growth;
- 4. Have a pH in the range of 5.0 to 7.5;
- 5. Have minimum organic matter content of 2.75-percent.
- k) All disturbed areas shall be seeded with Reed Canary grass applied at a rate of 20-pounds per acre. Grass seed shall have a germination of 75-percent and a minimum purity of 97percent.
- 1) A thick stand of grass shall be established on all areas and if a satisfactory stand is not produced after the initial seeding, the areas shall be relimed and/or reseeded until a satisfactory stand is developed at no additional cost to the Owner.
- m) All seeded areas shall be mulched with hay uniformly spread in a layer 1- to 1-1/2- inch thick, loose measurement. Hay shall be blown on in its natural length. Chopped hay shall not be used. No seeded areas shall remain unmulched longer than seven (7) days.
- n) If any mulch is displaced before the grass has made a growth of 1-1/2- inch, it shall be replaced without additional compensation.

END OF SECTION

SECTION 02240 DEWATERING AND DRAINAGE

PART 1: <u>GENERAL</u>

1.01 SCOPE OF WORK

- a. The Contractor shall complete all site drainage, runoff and soil erosion measures as detailed on the Contract Drawings and specified herein or elsewhere in the Specifications and as required to fulfill the intent of the Contract Drawings and Specifications.
- b. The Contractor shall construct such ditching and embankments and shall so grade his working areas to keep surface runoff from entering excavations or inundating existing facilities and improvements, and to maintain stable, undisturbed subgrades at the lowest excavation levels. Such runoff shall be channeled or directed to the sedimentation basins.
- c. The Contractor during all phases of his work shall carefully protect all existing structure, pipelines, drains, conduits, or other improvements on the site, and shall restore same to a condition equivalent to conditions existing prior to his operations. Ample precautions shall be taken to prevent settlement of existing improvements.
- d. Dewatering shall be provided for all pipelines, structures and for all other miscellaneous excavations, as specified herein.
- e. All existing pipelines and services shall be maintained or, where required, shall be removed and replaced to accommodate the work to be done under this Contract.

1.02 <u>RELATED WORK</u>

- a. Section 02315, Trenching, Backfilling and Compacting
- b. Section 02370, Erosion and Sedimentation Control

1.05 <u>SUBMITTALS</u>

- a. Prepare dewatering design for all excavations, as required. Design shall include calculations and drawings stamped and signed by a Professional Engineer registered in the State of Massachusetts, where applicable and required by Engineer.
- b. Employ the services of a dewatering specialist or firm when well points, deep wells, recharge systems, or equal systems are required. Specialist shall have completed at least 5 successful dewatering projects of equal size and complexity and with equal systems.

1.04 <u>PERMITS</u>

- a. The Contractor is to obtain, at his own cost, any permits required for construction of temporary dewatering systems.
- b. Water from pumping must be properly filtered before discharging. Method must meet all permit requirements and Federal, State and Local requirements.

PART 2: <u>PRODUCTS</u>

2.01 DEWATERING MATERIALS

- a. Provide erosion/sedimentation control devices as indicated and specified in Section 02370.
- b. Provide casings, well screens, fittings, pumps, power and other items required for dewatering system.
- c. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to sedimentation ponds.
- d. Provide portable sedimentation basins/tanks when sedimentation ponds are not available.
- e. Provide and store auxiliary dewatering equipment, including pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.

PART 3 - <u>EXECUTION</u>

3.01 <u>SITE DRAINAGE, RUNOFF, REMOVAL OF WATER AND PROTECTION FROM</u> <u>FLOODING</u>

- a. Dewatering activities shall be conducted and monitored daily to ensure that sedimentladen water is appropriately settled prior to discharge. The Contractor shall not permit silt-laden waters resulting directly or indirectly from any operations to discharge without prior sedimentation into any wetlands, surface waters, stream corridors or storm sewers. No discharge of water is allowed directly into an area of jurisdiction of the Wetlands Protection Act. If emergency dewatering requirements arise, the Contractor shall notify the Engineer so that written authorization can be obtained from regulators. See Specification Section 02370 regarding environmental protection for erosion and sedimentation control.
- a) There shall be no pumping of water directly from or to any wetland resource areas.
- b) All discharges from subsurface dewatering operations or soil drying beds shall be contained if dewatering discharges are sediment laden, techniques shall be employed to remove sediment prior to discharge. A sedimentation bag should be constructed and used as specified where necessary to protect discharge of silt and soil. The Contractor shall use good accepted construction techniques in dewatering the site for the duration of excavation, filling, compaction and surcharging activities. The Contractor shall use acceptable methods of dewatering, subject to review by the Engineer. All excavated areas shall be kept dry during fill placement, compaction, surcharge operations and throughout all phases of construction. Should an excavated area partially filled become inundated for any reason, the Contractor shall remove the inundating waters by an approved method within forty-eight (48) hours.

- c) The Contractor shall remove all water from the excavation promptly and continuously throughout the progress of the Work and shall keep the excavation dry at all times by approved methods such as sumps, underdrains, well points, or deep wells until the structures to be built therein are completed. Dewatering methods proposed by the Contractor shall be submitted to the Engineer for review prior to implementation.
- d) The Contractor shall exercise care to ensure that water does not collect in the bell or collar holes to sufficient depth to wet the bell or collar of pipes waiting to be jointed.
- e) Any adverse impacts to existing storm water systems, such as sediment deposition or erosion to natural areas shall be cleaned, removed, replaced or repaired by the contractor at his own cost.
- f) Dewatering shall be continuous where necessary to protect the work and/or to maintain satisfactory progress.
- g) When subgrades are soft, weak, or unstable due to improper dewatering techniques, remove and replace the materials at no cost to the Owner.
- h) Notify the Engineer immediately if any settlement or movement is detected of survey points adjacent to excavations being dewatered. If settlement is deemed by the Engineer to be related to the dewatering, submit a modified dewatering plan to the Engineer within 24 hours. Implement the approved modified plan and repair any damage incurred to the adjacent structure at no cost to the Owner.
- i) Any dewatering pumps which are to be in operation before 7:00 A.M. or after 5:00 P.M. of any day or night, or which are to be in operation on any Saturday, Sunday, or Holiday shall be operated by critical silenced motors so as not to disturb the Public.
- j) Precautions shall be taken to protect uncompleted work from flooding during storms or from other causes. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected.
- k) All necessary precautions shall be taken to prevent disturbance of, and to properly drain, the area upon which concrete is to be poured, and upon which pipe is to be laid. Contractor's plant and equipment shall be adequate to keep all concrete work dry until properly set, which shall be a minimum of 7-days after pouring.
- 1) The bottom of any excavation shall be protected immediately after exposure as indicated on the Drawings.
- m) When dewatering will occur in the vicinity of structures, the Contractor must monitor for adverse effects to structures due to dewatering and will be responsible to remedy same to the satisfaction of the Owner and Engineer.
- n) The Contractor shall dewater the excavation as required to lower the ground water level to a minimum of two-feet below grade at all times to limit potential "boils", loss of fines, or softening of the ground. If any of these conditions are observed, submit a modified dewatering plan to the Engineer within 48 hours. Implement the approved modified plan and repair any damage incurred.

- o) Where required to prevent flooding of streets and private property due to dewatering operations, the Contractor shall provide and install above ground temporary piping systems to direct the water to proper drainage facilities such as open fields or storm drainage system. The Contractor shall submit detailed drawings illustrating proposed dewatering systems, including discharge point, and methods to control soil erosion and sediment control structures to the Owner and the Engineer for review and approval prior to the start of construction. Any adverse impacts to existing storm water systems, such as sediment deposition or erosion to natural areas shall be cleaned, removed, replaced or repaired by the Contractor at his own cost.
- p) The dewatering of all areas where work must be performed under this Contract is the responsibility of the Contractor and no additional sum will be allowed for any dewatering operation, overtime, equipment rental or any other expense incurred due to the occurrence of ground water, surface water or water from possible leakage of existing buildings, structures and piping in the vicinity of the Contractor's operations.
- q) Do not discharge water into any sanitary sewer system.
- r) Provide separately controllable pumping lines.
- s) The Engineer reserves the right to sample discharge water at any time.
- t) Install erosion/sedimentation controls for velocity dissipation at point discharges onto non-paved surfaces.
- u) Do not remove dewatering system without written approval from the Engineer. Backfill and compact sumps or ditches with screened gravel or crushed stone in accordance with Section 02320, Borrow Materials. Remove well points and deep wells. Backfill abandoned well holes with cement grout having a water cement ratio of 1 to 1 by volume.

END OF SECTION

SECTION 02315 TRENCHING, BACKFILLING AND COMPACTING

PART 1: <u>GENERAL</u>

1.01 <u>SCOPE OF WORK</u>

- a. The Contractor shall excavate existing material from the site to the required lines, grades and slopes as shown on the Contract Documents and as described herein. Only those excavated materials which are approved by the Engineer shall be stockpiled for subsequent use in filling and backfilling. Unsuitable excavated materials or excess excavated materials, including clay, silt, organic soils, decomposed shale, rocks, sludge, man-made fills and all material detrimental to the subsequent component support and a real subsidence as may be designated by the Engineer, shall be removed and disposed of at an approved off-site location.
- b. All existing pipelines and services shall be maintained or, where required, shall be removed and replaced to accommodate the work to be done under this Contract.
- c. All costs for removal and disposal of unsuitable excavated fill shall be included within the various unit prices provided within the bid.
- d. Contaminated excavated soil shall not be used for backfilling and shall be disposed in compliance with local and state regulations. Contractor shall refer to MassDEP Massachusetts Contingency Plan for contamination thresholds for the site conditions.
- e. In accordance with 520 CMR 14.00, no person shall, except in an emergency, make an excavation in any public way, public property, or privately-owned land until a permit is obtained from the appropriate designated permitting authority. For this project, the permit should be obtained from the Town of West Springfield.
- f. All Excavation, Trenching, and related Earth Retention Systems shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P), 520 CMR 14.00, and other State and local requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

1.02 <u>SUBMITTALS</u>

- a. Drawings and calculations for each Earth Retention System required in the Work. The submittal shall be in sufficient detail to disclose the method of operation for each of the various stages of construction required for the completion of the Earth Retention Systems.
 - 1. Submit calculations and drawings for Earth Retention Systems prepared, signed and stamped by a Professional Engineer registered in the state where the work is performed.
- b. All materials to be used for backfill, including common fill and bedding materials, shall be approved by Engineer prior to placing the materials in the pipe trench. All backfill

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and bedding materials whether obtained from the trench excavation or from an off-site source must be tested as directed by the Engineer.

- c. Modified Proctor Test (ASTM D1557) results and soil classification (ASTM D2487) for all proposed backfill materials at the frequency specified below:
 - 1. For suitable soil materials removed during Excavation, perform one test for every 1,000 cubic yards of similar soil type. Similarity of soil types will be as determined by the Engineer.
 - 2. For borrow materials; perform tests at frequency specified in Section 02320, Borrow Materials.
- d. Compaction test results (i.e. ASTM D6938 or ASTM D1556) at a frequency of one test for every 100 cubic yards of material backfilled or at a minimum of one test per lift. The Engineer will determine the locations and lifts to be tested. The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.
 - 1. Methods and equipment proposed for compaction shall be subject to prior review by the Engineer. Compaction generally shall be done with vibrating equipment. Static rolling without vibration may be required by the Engineer on sensitive soils that become unstable under vibration. Displacement of, or damage to existing utilities or structure shall be avoided. Any utility or structure damaged thereby shall be replaced or repaired as directed by the Engineer.
 - 2. Additional compaction testing may be required when there is evidence of a change in the quality of moisture control or the effectiveness of compaction. Any costs associated with correcting and retesting as a result of a failure to meet compaction requirements shall be borne by the Contractor.
 - 3. If all compaction test results within the initial 25% of the total anticipated number of tests indicate compacted field densities equal to or greater than the project requirements, the Engineer may reduce frequency of compaction testing. In no case will the frequency be reduced to less than one test for every 500 cubic yards of material backfilled.
 - 4. The Contractor is cautioned that compaction testing by nuclear methods may not be effective where trenches are so narrow that trench walls impact the attenuation of the gamma radiation, when adjacent to concrete that impacts the accuracy of determining moisture content, or where oversize particles (i.e. large cobbles or coarse gravels) are present. In these cases, other field density testing methods may be required.

1.03 <u>RELATED WORK</u>

a. Section 02215 - Test Pits

1.04 PROFILES AND TOPOGRAPHY

- a. Contours, topography and profiles of the ground shown on the Drawings are believed to be reasonably correct, but are not guaranteed to be absolutely so and are presented only as an approximation.
- b. The Contractor shall accept the construction site with conditions the same as existed at the time of bidding.

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PART 2: <u>PRODUCTS</u>

2.01 FILL MATERIALS

- a. Fill material is subject to the approval of the Engineer and may be either material removed from excavations or borrow from off site. Fill material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, stable fill.
- b. Satisfactory fill materials shall include materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, SW, and SP. Additional requirements are included in Section 02320, Borrow Materials.
- c. Satisfactory fill materials shall not contain trash, refuse, vegetation, masses of roots, individual roots more than 18 inches long or more than 1/2 inch in diameter, or stones over 6 inches in diameter. Unless otherwise stated in the Contract Documents, organic matter shall not exceed minor quantities and shall be well distributed.
- d. Satisfactory fill materials shall not contain frozen materials nor shall backfill be placed on frozen material.
- e. Excavated surface and/or pavement materials such as gravel or trap rock that are salvaged may be used as a sub-grade material, if processed to the required gradation and compacted to the required degree of compaction. In no case shall salvaged materials be substituted for the required gravel base
- f. Bedding sand material should be graded as follows:

Sieve No. (Particle Size)	Percent Passing
3/4-inch	100
4 (4.76mm)	80 - 100
50 (0.297mm)	0 – 25
200 (0.074mm)	0 – 5

Bedding Sand Gradation

2.02 CONTROLLED DENSITY FILL

- a. Controlled density fill (CDF) shall meet the Massachusetts Department of Transportation Standard Specification for Highways and Bridges, 1988 Edition, as amended ("State Specs"), in particular, Supplemental Specifications (M.4.08.0, 2006) for Concrete Type 2E, Flowable Fill, Excavatable.
- b. Controlled density fill shall be flowable, excavatable and shall require no vibration for placement. Compressive strength at 28 days shall be 30 to 80 psi and the slump shall be 10 to 12 inches.

- c. Controlled Density Fill material shall be a mixture of portland cement, fly ash, sand, and water designed to provide strengths within the range specified. Type 2E excavatable mix shall be hand-tool excavatable. CDF is to be batched at a ready mix plant and is to be used at a high or very high slump of approximately 10" to 12" (250 mm to 300 mm). It shall be flowable, require no vibration and after it has been placed can be excavatable by hand tools and/or small machines. The ingredients shall comply with the following: Portland Cement AASHTO M 85; Fly Ash AASHTO M 295, Class F; Sand M4.02.02 (State Specs); Air entraining admixtures M4.02.05 (State Specs).
- d. Quality Control shall be subject to:
 - 1. In lieu of the slump test, a 6" long, 3" diameter tube may be filled to the top and then slowly raised. The diameter of the resulting "pancake" may be measured and the range of the diameter shall be 9" to 14".
 - 2. The maximum for structural flowable fills may be in the 1000's of psi and will depend on the Engineer's requirements.
 - 3. High air may be used instead of fly ash with an adjustment in sand content.
- e. Compressive Strength @ 28 days: 30 80 psi; Compressive Strength @ 90 days: 100 psi maximum. May be changed by Design Engineer to fit particular job requirements.

PART 3: <u>EXECUTION</u>

3.01 EXCAVATION, REMOVAL AND DISPOSAL OF MATERIALS

- a. All excavation shall be accomplished in such a manner which will not adversely affect otherwise acceptable underlying soil. Perform excavation to the lines and grades indicated on the Drawings. Backfill unauthorized over-excavation in accordance with the provisions of this Section.
- b. Excavate with equipment selected to minimize damage to existing utilities or other facilities. Hand excavate as necessary to locate utilities or avoid damage.
- c. During the general excavation process the Contractor should take care to assure proper site drainage at all times in order that a minimum amount of subgrade disturbance occurs.
- d. Sawcut the existing pavement in the vicinity of the excavation prior to the start of excavation in paved areas, so as to prevent damage to the paving outside the requirements of construction.
- e. Perform excavation in such a manner as to prevent disturbance of the final subgrade. The Engineer or Owner may require the final six inches of excavation be performed by hand, with the use of a smooth-faced bucket, or other means acceptable to the Engineer or Owner, at no additional cost if subgrade disturbance is considered excessive as judged by the Engineer or Owner.
- f. During excavation, material satisfactory for backfill shall be stockpiled in an orderly manner at a distance from the sides of the excavation equal to at least one half the depth of the excavation, but in no case closer than 2 feet.

- 1. Excavated material not required or not suitable for backfill shall be removed from the site.
- 2. Perform grading to prevent surface water from flowing into the excavation.
- 3. Pile excavated material in a manner that will endanger neither the safety of personnel in the excavation nor the Work itself. Avoid obstructing sidewalks and driveways.
- 4. Hydrants under pressure, valve pit covers, valve boxes, manholes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the Work is completed.
- g. Grade or create berms or swales to direct surface water from excavations to appropriate structures designed to accommodate storm water. If no structures exist, direct water to areas that minimize impacts to adjacent structures and properties.
- h. Make pipe trenches as narrow as practicable and keep the sides of the trenches undisturbed until backfilling has been completed. Provide a clear distance of 12 inches on each side of the pipe.
- i. If satisfactory materials are not encountered at the design subgrade level, excavate unsatisfactory materials to the depth directed by the Engineer and properly dispose of the material. Backfill the resulting extra depth of excavation with satisfactory fill materials and compact in accordance with the provisions of this Section.
- j. Prior to site filling, a control and stripping operation shall be performed across the entire site, or approved portion of the site, to receive fill. The depth of stripping will vary across the site and shall be determined by the Engineer.
- k. Fill operation for components founded within new fill shall be conducted to produce an initial fill height at least two feet above the component subgrade elevation before foundation excavation begins.
- 1. The foundation excavations shall be performed using as a maximum of 1 to 1.5 construction slope for open cuts. The subgrade preparation shall include proof rolling in over excavations, removal of any soft and unsuitable materials, compaction of loose granular materials and provisions for work mat when cohesive insitu soils are encountered at the founding elevations.
- m. If any over excavation is caused by the Contractor's error, or wherever the excavation is carried beyond or below the lines and grade given by the Engineer, the Contractor shall, at his own expense, backfill unauthorized over-excavation in accordance with the provisions of this Section.

3.02 BACKFILL AND COMPACTION

a. Unless otherwise specified or indicated on the Drawings, use satisfactory material removed during excavation for backfilling trenches. Native material that has been screened for cobbles and boulders and with less than 15 percent fine grained content may be used as general backfill and be placed and compacted in six-inch loose lifts to the top

of pipe. The Engineer may require stockpiling, drying, blending and reuse of materials from sources on the Project.

- b. Spread and compact the material promptly after it has been deposited. When, in the Engineer's judgment, equipment is inadequate to spread and compact the material properly, reduce the rate of placing of the fill or employ additional
- c. Prior to backfilling or placement of structures, excavated subgrades shall be proof compacted with either 10 passes of a 10-ton vibratory drum roller for open excavations or 6 passes of a large, reversible, walk behind vibratory compactor capable of exerting a minimum force of 2,000 pounds in trench or pit excavations. Soft or weak spots shall be over-excavated and replaced with compacted Granular Fill or compacted Crushed Stone wrapped in a non-woven geotextile, as directed by the Owner or their representative. If proof compaction will prove detrimental to the subgrade due to the presence of groundwater, static rolling may be allowed at the discretion of the Engineer or Owner.
- d. Soil bearing surfaces shall be protected against freezing and the elements before and after concrete placement. If construction is performed during freezing weather, structures shall be backfilled as soon as possible after they are constructed. Insulating blankets or other means shall be used for protection against freezing at the discretion of the Engineer or Owner.
- e. When excavated material is specified for backfill and there is an insufficient amount of this material at a particular location on the Project due to rejection of a portion thereof, consideration will be given to the use of excess material from one portion of the Project to make up the deficiency existing on other portions of the Project. Use borrow material if there is no excess of excavated material available at other portions of the Project.
- f. Backfilling and compaction methods shall attain 95% of maximum dry density at optimum moisture content as determined in accordance with ASTM D1557.
- g. Do not place stone or rock fragment larger than six inches in greatest dimension in the backfill.
- h. Maximum loose lift height for backfilling existing or borrow material shall be 12 inches, unless satisfactory compaction is demonstrated otherwise to the Engineer through field-testing. In no case shall loose lift height for backfilling exceed 2 feet.
- i. Do not drop large masses of backfill material into the trench endangering the pipe or adjacent utilities.

3.03 MAINTENANCE OF FILLS

- a. All vehicles passing over the fill areas shall use diverse routes to insure uniform compaction of the fill.
- b. Before shutdown of the work for any cause, and at the conclusion of work for the day, fill shall be properly compacted to the satisfaction of the Engineer and bladed to a grade which will insure drainage away from the unfinished surface of the fill. Traveled surfaces must be graveled at the surface.

c. Excess materials shall be stored as directed by the Engineer, and following completion of the work shall be removed from the site.

3.04 CONSTRUCTION EQUIPMENT

a. The Contractor shall select his equipment such that, to the maximum extent possible, damage to existing surfaces and structures is minimized. It is the Contractor's responsibility, to repair, at his expense, any damages due to the use of any equipment to complete the work.

3.05 NOISE, DUST AND ODOR CONTROL

a. The Contractor's construction activities shall be conducted so as to eliminate all unnecessary noise, dust and odors.

3.06 **PROTECTION OF TREES**

a. Special care shall be taken to avoid damage to trees and their root system. Machine excavation shall not be used when, in the opinion of the Engineer, it would endanger the tree. In general, where the line of trench falls within the limits of the limb spread, headers are required across the trench to protect the tree. The operation of all equipment, particularly when employing booms, the storage of materials, and the disposition of excavation shall be conducted in a manner which will not injure trees, trunks, branches or their roots unless such trees are designated for removal.

3.07 TRENCH SUPPORT

- a. Where necessary, particularly to prevent disturbance, damage or settlement of adjacent structures, pipelines, utilities, improvements or paving, excavation shall be adequately sheeted and braced. Details of sheeting and bracing shall be submitted to the Engineer prior to installation.
- b. Sheeting and bracing shall remain in place until the pipe has been laid, tested for defects and repaired, if necessary, and the earth around the pipe compacted to a depth of two feet over the top of the pipe. Sheeting and bracing of all excavation shall comply with the requirements of 520 CMR 14.00.
- c. Where sheeting and bracing systems are used, they must be designed by a Professional Engineer licensed in the State of Massachusetts. The Contractor shall submit a sheeting plan to the Engineer as proof that the design has been done; however, this submittal will not be considered as a shop drawing and the Engineer will not be responsible for the adequacy or safety of the sheeting design or installation. Trench boxes shall be acceptable.
- d. Any damage to new or existing structures occurring through settlement, water or earth pressure, or other causes due to inadequate bracing or through negligence or fault of the Contractor in any other manner, shall be repaired by the Contractor at his own expense.
- e. The Contractor shall specifically comply with OSHA Standards for Excavations (29 CFR Part 1926), "OSHA Standards." As such, the Contractor shall be responsible for providing a "competent person" as defined in the OSHA Standards and as required by the standards. The Contractor shall be solely responsible for the selection, design, installation, and implementation of all "protective systems" as defined in the OSHA Standards. The pipeline design by the Owner, the Engineer, or the Engineer's Consultant

does <u>not</u> include the design of the "protective systems" since the design of the "protective systems" is the responsibility of the Contractor.

3.08 TRENCH MAINTENANCE

- a. The Contractor shall be responsible for the condition of the trenches for a period of one (1) year from the date of the final acceptance of the Contractor's work, or as required by state, county or local authorities, and any materials required for filling depressions caused by settlement or washout shall be supplied and placed by the Contractor at his expense.
- b. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required to correct the problem, and shall then be refilled and properly compacted with the surface restored to required grade at no additional expense.

3.09 SAW CUTTING OF EXISTING ASPHALT AND/OR CONCRETE PAVEMENT

- a. The Contractor shall saw cut existing Hot Mix Asphalt (HMA) pavement and/or concrete subgrade to the full depth of bound layers. Saw cut lines shall be parallel and perpendicular to the roadway baseline a minimum of 1-foot outside of extents of excavation.
- b. The existing HMA and/or concrete base course shall be saw cut with a diamond tipped circular cutting blade. The full-depth saw cut shall be made with one clean straight pass of the saw.
- c. The Contractor shall remove and dispose of material within the boundary of the saw cuts to form rectangular openings with vertical sides and clean the area.
- d. Shape and compact the underlying surface to produce a firm, level base.
- e. Ensure that the remaining pavement is not damaged. Any area of the remaining roadway that is damaged by the activities of the Contractor shall be repaired by the Contractor at no additional cost to the Owner.
- f. Polymerized joint adhesive or tack coat shall be applied to all vertical, saw cut surfaces of the roadway openings.

END OF SECTION

SECTION 02320 BORROW MATERIALS

PART 1: GENERAL

1.01 <u>SCOPE OF WORK</u>

a. The Contractor shall furnish all fill and backfill material required for site preparation and to meet finished elevations as shown on the Contract Drawings. The Contractor is to familiarize itself thoroughly with the types and nature of the fill materials which are required for the project. No material shall be placed prior to the approval of Samples by the Engineer.

1.02 <u>SUBMITTALS</u>

- a. The Contractor shall furnish the Engineer with 1 to 3 representative bag samples and a gradation analysis of each type of soil proposed for use on the project. Testing of the material shall be at the Contractor's expense.
- b. Provide sieve analysis (ASTM C136) and permeability analysis (ASTM D2434) from an AASHTO-accredited soil testing laboratory for all proposed materials. Take and test at least one sample, at no additional cost to the Owner, for every 1,500 c.y. of material placed.
- c. Provide a modified proctor analysis (ASTM D1557) from an AASHTO-accredited soil testing laboratory for all proposed placed material.
 1. Take and test a minimum of 1 sample per intended material type, at a frequency of one per 5,000 cy of material placed for low permeability soil, or as directed by the Engineer.
 2. All other placed materials shall be tested once unless more frequent testing is deemed necessary by the Engineer or Owner due to material variation.
- d. The Engineer reserves the right to require more frequent testing than that which is specified above should the material characteristics change.

1.03 <u>RELATED WORK</u>

a. Section 02315 - Trenching, Backfilling, and Compacting

PART 2: PRODUCTS

2.01 STRUCTURAL FILL

a. Compacted Structural Fill shall be used to replace unsuitable soils or unsatisfactory conditions, as defined in geotechnical report, beneath chambers and structures, or other area where a firm, free-draining subgrade is needed. Structural Fill shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.

b. Gradation requirements shall conform to the following:

Sieve Size	Percent Passing
3-inch	100
1 ¹ /2-inch	60 - 100
No. 4	30 - 60
No. 200	0 - 10

c. Stockpile the processed materials in such a manner to minimize segregation of particle sizes. All structural fill shall come from approved stockpiles.

2.02 <u>BEDDING SAND</u>

a. Bedding Sand material shall be used to replace unsuitable soils or unsatisfactory conditions, as defined in geotechnical report, beneath sanitary sewer and utilities. Bedding Sand shall consist of clean, inert, hard, durable grains of quartz or other hard, durable, rock, free from loam or clay, surface coatings and deleterious materials. Material shall consist of a clean, non-plastic, granular material conforming to the requirements of a SW, SP or SM under the Unified Soil Classification System (USCS) (ASTM D2487). Gradation requirements shall conform to the following:

Sieve Size	Percent Passing
3/4-inch	100
No. 4	80 - 100
No. 50	0 - 25
No. 200	0 – 5

a. The material shall have the characteristics that when placed and compacted, the soil particles will bind together so as to form a solid, stable surface capable of supporting rubber-tired vehicular traffic during wet weather periods as well as extended dry weather periods. The borrow material shall not contain fines to the extent that the surface layer becomes "greasy" when wet. Material consisting of frozen clogs, ice and snow will be rejected.

PART 3: EXECUTION

3.01 INSTALLATION

- a. Prior to the placement material, site preparation shall be completed as required by the Contract Documents and approved by the Engineer.
- b. Ensure that all materials are properly stockpiled on site to prevent contamination by other materials, and to prevent segregation
- c. Place soil material over the entire area in uniform lifts and compact in accordance with Section 02315, Trenching, Backfilling, and Compacting.
- d. Utilize on-site soils prior to using imported fill provided on-site soils meet the requirements of the specifications.

- e. Material used as a replacement for unsuitable soil is not intended to be an aid to dewatering.
- f. Shape Bedding Sand used for pipe foundation material so that it supports the pipe properly and will not damage the pipe, bells, collars, or the pipe fittings.

END SECTION

SECTION 02370 EROSION AND SEDIMENTATION CONTROL

PART 1: GENERAL

1.01 SCOPE OF WORK

- a. The Contractor shall furnish all labor, materials and equipment required to control, within reasonable limits, soil erosion resulting from construction operations, prevent excessive flow of sediment from the construction site and generally take all measures necessary to preserve and protect the site and environs from environmental impact due to the construction activities either on or off-site during all phases of the project construction.
- b. The required measures shall include, but are not necessarily limited to: providing erosion and sediment control methods and devices; the installation of water diversion structures, diversion ditches, sediment basins, hay bales, straw wattles, silt fence, seeding, mulching, matting or sodding. Critical Areas to provide temporary protection; confining the activities of his and his subcontractor's equipment and workmen to the designated site boundaries, except as may be required for site ingress and egress; taking effective measures to minimize and control noise due to construction operations; complying with all municipal, County, State and Federal regulations regarding open burning, air pollution and water pollution control; disposing of all surplus, unusable and unsuitable excavated material, brush, piles, trees, debris and rubbish to licensed landfill areas outside the site or to other approved off-site locations; providing approved sanitary facilities in sufficient numbers for all workers and visitors to the site, including the Owner, the Engineer, their representatives, and representatives of all agencies authorized to visit the site; protection of all surface and ground waters at the site and in proximity to the site; clean-up work at the completion of the project; and all other measures as described hereinafter required to fulfill the intent of this section of the Specifications.

1.02 <u>SUBMITTALS</u>

- a. The Contractor shall be responsible for preparing and obtaining permit coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit and complying with all terms and conditions of said permit. At least 14 days prior to the start of construction, the applicant shall submit a copy of the Stormwater Pollution Prevention Plan and Notice of Intent (NOI) required by NPDES to the West Springfield Local Conservation Commission (LCC) for its records.
- b. The Contractor shall submit details on proposed construction entrances, silt fence, silt bag and any other applicable erosion and sediment control measures proposed.
- c. A wetland Order of Conditions is attached to the Supplementary Conditions of this Project Manual. Prior to construction the Contractor, site foreman and/or construction manager and person employed to perform earth moving activity shall submit a letter of understanding to the Commission stating that they have received, read, understand and shall comply with this Order.

d. Prior to the start of any work, emergency contact phone numbers, including cell phone numbers of the Contractor, site foreman, and construction manager shall be furnished to the Engineer for submittal to the LCC.

1.03 PROHIBITED CONSTRUCTION ACTIVTIES

- a. The Contractor shall refrain specifically from the following construction activities, as well as others which may be elsewhere in this Section or other Sections of the Specifications:
 - 1. Any material placed in any wetland or other resource area without specific authorization under the Order of Conditions shall be removed immediately upon demand of the Engineer, Environmental Consultant, or LCC. Activities prohibited within any resource area or its buffer zone except as authorized in the approved plans:
 - a. Operation of equipment, storage of materials, stockpiling or soil, or other site disturbance;
 - b. Stockpiling of debris, aggregate, fill, excavated material, construction material and building material; it shall also be stockpiled far enough away to prevent sediment from entering any wetland resource area;
 - c. Burying or disposal of debris or any other materials, other than that fill which may be allowed by the Order of Conditions and as shown on the approved plans;
 - d. Underground storage of fuel or other hazardous substances;
 - e. Dumping of leaves, grass clippings, brush, stumps, construction and yard debris or materials of any kind, unless expressly permitted by the Order of Conditions and the approved plans;
- b. Refueling, servicing, and repair of motorized construction vehicles. Equipment operators shall be prepared to immediately respond to accidental releases of fuel, motor oil, and other liquids through containment. If any release of fuel, motor oil, lubricating oils, etc. occurs, the Contractor shall notify the Engineer immediately for the proper federal, state, and or local notification requirements. When trucks leave the construction site, the tires shall be clean.
- c. The Contractor shall, upon notification of the Engineer, cease any operation which, in the opinion of the Engineer, are considered to be prohibited construction procedures. The Contractor shall correct, at the direction of the Engineer, any defects of said operations, at no cost to the Owner.

PART 2: PRODUCTS

2.01 <u>MATERIALS</u>

- a. All materials such as seeds, mulch and bales shall conform to the applicable Federal, State and Local requirements.
- b. Hay bales required for siltation control shall be wire tied bales of the type normally used for siltation or erosion control for construction projects.
- c. Straw bales required for siltation control shall be wire tied bales of the type normally used for siltation or erosion control for construction projects.
- d. Filter fabric siltation fencing shall be a woven filter fabric having a weight of at least 2.5 ounces per square yard, a thickness of at least 17 mils, a coefficient of permeability of not less than 0.0009 centimeters per second and allows a water flow rate of a minimum 40 gallons per minute per square yard. The material shall have a high sediment filtration capacity, high slurry flow and minimum clogging characteristics. The material shall be equal to 100x as manufactured by Mirafi, Inc., Charlotte, North Carolina; Amoco 2130 by Nilex, Inc., Centennial, CO; MISF 180 by Mutual Industries, PA; or equal.
- e. Straw wattles required for siltation control consist of recycled, compressed, 100% agricultural straw wrapped in tubular, UV stabilized synthetic netting. Straw wattles shall be North America Green or equal.
- f. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair or replace silt fences, straw bales, erosion control blankets, riprap, filter berms, straw wattles, or other devices planned for use during construction.

PART 3: EXECUTION

3.01 EROSION AND SEDIMENT CONTROL

- a. The Contractor is to comply with all local and State regulations for soil erosion and sediment control.
- b. A wetlands Order of Conditions is attached to the Supplementary Conditions of this Project Manual. All Contractors working at the site shall be made aware of the provisions contained within the Order and adhere to all Conditions within. At all times, the site foreman, supervising engineer or construction manager shall have a copy of the Order at the site and direct compliance with the requirements of the Order.
- c. In accordance with Federal and State Stormwater requirements, all project sites shall incorporate trap rock at all construction entrances and shall maintain either a 25-foot undisturbed buffer of vegetation or a sedimentation silt fence barrier between the work site and any unpaved roads, or neighboring properties to prevent erosion and sedimentation from being carried off site.

- d. All clearing is to be done in such a manner to provide minimum exposure of soils wherever possible. The Contractor is to provide approved mulching and is to take other protective measures as required to protect undisturbed, disturbed and new soils from erosion.
- e. All temporary disposal sites and stockpile areas shall be so located to prohibit runoff of silt and soil to natural water courses. Where necessary, the Contractor shall provide temporary ditching and dikes designed to retain all pumpage and runoff from the site for a period of time sufficient to settle out suspended materials before disposal of this water.
- f. Before commencing any construction activities, including clearing, grubbing, and fence erection, the Contractor shall first provide ditching, silt fencing, construct temporary sediment basins and grade the construction area so as to completely prohibit any excavated or fill soils, silts and other materials resulting from construction operations from being carried off and away from the construction area. No other excavation work shall be permitted, and no fill shall be brought onto the site until the Engineer has given conditional approval of the Contractor's proposed works for controlling soil erosion and sediment control.
- g. All erosion and sediment control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is completed. All temporary erosion and sedimentation control devices shall be removed after construction has been completed and the construction area is stabilized (i.e., haybales shall not be allowed to rot in place).
- h. During construction street sweeping shall occur as needed.
- i. Cement trucks shall not be washed out in any wetland resource area or buffer zone, or into any drainage system. Any deposit of cement or concrete products into a buffer zone or wetland resource area shall be immediately removed.
- j. All exposed soils at the site for periods greater than 14 days shall be stabilized with erosion control blanket or netting, a covering of straw mulch, or other erosion best management practice, to prevent erosion and sedimentation into wetland resource areas. Drainage ditches shall be hydro-seeded with a perennial grass mixture is exposed for more than 30 days. Any stabilization materials such as jute netting shall be firmly anchored to prevent them from being washed from slopes by rain or flooding. Preference shall be given to biodegradable materials.
- k. Removal or storing of any snow activities shall adhere to the Bureau of Resource Protection's *Snow Disposal Guidance* Guideline No. BWR G2015-01 document dated December 21, 2015.
- 1. Site grading and construction shall be scheduled to avoid periods of heavy rainfall and periods of high surface water. Erosion controls shall be inspected after every rainfall to assure that maximum control has been provided.
- m. In areas where final restoration is expected to be completed within 7 days after the completion of construction, no temporary protective measures will be required. If final restoration is expected to begin more than 7 days and be completed more than 30 days after the start of construction, seeding shall be required for temporary protection, except

where seasonal conditions are not suitable for growing vegetation. In this case, mulch may be applied until conditions are suitable for establishing vegetative cover or until final restoration is implemented. Use jute netting on areas having a slope greater than 3 horizontal to 1 vertical, to anchor the mulch until a satisfactory growth is obtained.

1. Temporary seeding and control measures shall include applying:

a. Annual Ryegrass:	rate of 40 pounds per acre
b.Limestone:	rate of 1 ton per acre
c. 10-10-10 Fertilizer:	rate of 500 pounds per acre
d.Mulch:	rate of 3 tons per acre

- n. Silt sacks shall be used and maintained in any catch basin down gradient from where construction is taking place, except in cases where public safety is a concern. In these cases an alternate method of protecting basins shall be approved prior to the start of construction. Controls shall remain in place until the site is stable. Accumulated sediment in the Silt sacks shall be removed as it accumulates.
- o. When ordered by the Engineer, all existing temporary work as specified in the preceding paragraph shall be removed and the site restored and brought to the lines and grades shown on the Contract Drawings.
- p. If effective control of erosion and sediment is not accomplished, in the opinion of the Engineer or regulatory agency(ies), additional controls shall be proposed by the Contractor for the Engineer' approval. Failure of the Contractor to provide adequate erosion and sediment controls shall be just cause for stopping construction operations until satisfactory control measures have been implemented.

3.02 SEQUENCE OF EROSION CONTROL MEASURES

- a. The sequence of development for environmental work must be rigidly adhered to for adequate environmental protection during and after construction activities. The sequence shall be as follows:
 - 1. <u>Install silt fence-sediment barrier</u> The silt fence-sediment barrier delineating the construction site shall be put in place where shown on the Drawings or as directed by the Engineer, prior to any stockpiling or construction activities. The sediment barrier shall remain erect until all construction and environmental restoration measures have been completed.
 - 2. <u>Inlet Protection</u> All inlets installed prior or during construction shall be protected by straw bales or other suitable means as approved by the Engineer. These sediment barriers shall be left in place until all construction activities have been completed and permanent stabilization has been established.
 - 3. <u>Construct Sedimentation Basin</u> The Contractor shall install adequately sized sedimentation basins prior to the commencement of any dewatering activities as directed by the Engineer. The basin shall not be removed until all dewatering has been completed.

- 4. <u>Protection of stockpiled fill from wind and/or water erosion</u> Any suitable fill to be stockpiled for longer than 14 days shall be protected from wind and/or water erosion by suitable methods delineated in the Environmental Specifications.
- 5. <u>Restoration of storage and stockpile sites</u> Restoration of storage and/or stockpile sites shall commence as soon as the sites are no longer needed for storage or stockpiling of construction materials.
- 6. <u>Permanent soil stabilization and vegetative restoration</u> Permanent soil stabilization and vegetative restoration shall commence as soon as possible after construction has been completed. Excavated stones and boulders are to be removed from the site. Care is to be taken to avoid damage to adjacent vegetation and to prevent formation of depressions which would serve as mosquito breeding areas. All installed hay bales or other soil erosion and sediment control materials and structures are to be removed. Areas to receive permanent stabilization are to be graded as shown on the Contract Drawings, or as specified, required, or directed, to restore the unconstrained areas of the site to their original or final landscaped condition.

3.03 CULTURAL RESOURCES

a. If, during the course of construction, unexpected archaeological or historic resources are encountered, the Contractor must immediately halt all construction in the vicinity of the discovery and contact the Owner.

3.04 <u>COORDINATION WITH LOCAL CONSERVATION COMMISSION</u>

- a. Prior to the start of any work, a pre-construction conference shall be held between the Engineer, Owner, Contractor, and representative of the LCC.
- b. The Contractor shall coordinate with LCC representative throughout the Work, as needed.
- c. The erosion and sedimentation controls shall be as specified in this Section and as indicated and specified on the approved Drawings.

*******END OF SECTION***

SECTION 02530 MANHOLES AND CATCH BASINS

PART 1: GENERAL

1.01 <u>SCOPE OF WORK</u>

a. The Contractor shall provide precast concrete manholes and catch basins with flexible sleeves, exterior and interior wall coating, and manhole steps. The manholes and catch basins shall be complete in all respects and shall include the frames and covers of required types, masonry leveling courses for frames, stubs for future sewers, internal and external drop piping, channeling, benching and joint plastering, and concrete encasement of external drop connection piping shall be included in the price of the manholes.

1.02 <u>SUBMITTALS</u>

- a. Submit Shop Drawings, showing all details of construction, including, but not limited to, structure dimensions, reinforcing, joints, and pipe connections to structures.
- b. Submit on all materials and products included in this specification, including, but not limited to, manhole rungs, manhole frames and covers, dampproofing coating, brick masonry, mortar, non-shrink water-proof grout, catch basin frames and grates and manhole chimneys.
- c. Submit weights of manhole frames and covers and catch basin frames and grates.
- d. Submit design calculations including verification of adequate anti-flotation features and lateral earth pressures. Calculations shall verify that the manhole structure has been designed to withstand the burial depth, submergence due to flooding, flotation, and dead and live loads.
- e. Submit certifications regarding all iron or steel products that all manufacturing processes occurred in the US.

PART 2: PRODUCTS

2.01 AMERICAN IRON AND STEEL REQUIREMENT

a. All iron and steel products included in this section shall be manufactured in the US. Refer to Section 00800 for further description of the American Iron and Steel requirement.

2.02 PRECAST CONCRETE MANHOLE AND CATCH BASIN SECTIONS

- a. Precast concrete manholes and catch basins shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming with the typical manhole and catch basin details as shown on the standard details included on the Drawings.
- b. Precast manhole and catch basin sections shall be manufactured in accordance with ASTM Designation C478. Minimum compressive strength shall be 5,000 PSI at 28 days, and pre-cast concrete sections shall not be shipped until after concrete has attained a

minimum 5,000 PSI compressive strength, and the minimum cement content shall be 600 lbs of cement per cubic yard of concrete. The maximum allowable absorption of the concrete shall not exceed eight (8) percent of the dry weight. Tests, if required, shall be similar to those described in ASTM C76. The circumferential steel reinforcement for riser pipe, cone sections and base walls shall be a minimum of 0.12 square inches per lineal foot. Reinforcing in both layers of steel of the flat slab top sections and in the layer of steel in the bottoms of bases shall be a minimum of 0.12 square inches per lineal foot in both directions.

- c. Flat slab tops shall have a minimum thickness of six (6) inches for risers up to forty-eight (48) inches in diameter and eight (8) inches for larger diameters. Top sections shall have a top width of such design and dimensions as to properly support the required manhole frame and cover and the lower joint shall be of tongue and groove design.
- d. Joints of the manhole/catch basin sections shall be formed entirely of concrete employing a round rubber gasket conforming to ASTM C443 and, when assembled, shall be self-centering and make a uniform watertight joint. Except for those surfaces within the gasket groove, all inside surfaces of the bell or outside surfaces of the spigot, or both, on which the rubber gasket may bear during the closure of the joint and at any degree of partial closure shall be parallel within one (1) degree and have an angle of not more than two (2) degrees with the longitudinal axis of the pipe. In joints formed entirely of concrete, the distance from either side of the gasket to the end of the bell or spigot shall not be less than 3/4 inch. The gasket spaces between the bell and spigot shall be so shaped as to provide grooves that will prevent the gasket from disengaging from its compression surface or being blown out by hydrostatic pressures. Joints shall be mortared on exterior and interior surfaces.
- e. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on each precast section.
- f. Flexible sleeves shall be provided for all pipes entering manholes and catch basins. These opening sleeves shall be integrally cast with the base-sections. Each sleeve shall be set to the correct alignment and elevation. Clamps shall be stainless steel.
- g. Floors and inverts shall be best quality precast concrete. Inverts shall have a cross section of the exact shape of the sewers and storm drains which are connected, and changes in size shall be made gradually and evenly, unless otherwise specifically directed. Half pipe inverts may be used in straight-through manholes.
- h. Drop manholes shall be provided as shown on the Drawings. Drop manhole should be external drop and piping shall be encased in concrete as shown on the typical details. Approved precast concrete drop sections may be used in lieu of field poured concrete.

2.03 MANHOLE FRAMES AND COVERS

a. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind. Manholes covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30B or ASTM A48, Class 35B.

b. Covers shall have a diamond pattern, pickholes and the word "STORM" or "SANITARY", as appropriate, cast in 3/4-inch raised letters (recessed). Manhole frame and covers shall be manufactured by East Jordan Iron Works; Mechanics Iron Foundry; Neenah Foundry or equal. Frames and covers shall be approved for use by the Massachusetts Department of Transportation – Highway Division, shall comply with the details shown on the Drawing, and be designed for a minimum of AASHTO HS20-44 loading.

2.04 CATCH BASIN FRAMES AND COVERS

- a. Catch basin frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind. Grate and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30B or ASTM A48, Class 35B.
- a. Grates shall have the words "DUMP NO WASTE" and "DRAINS TO WATERWAYS", cast in 3/8-inch raised letters. Frames and grates shall comply with the details shown on the Drawings and be designed for a minimum of AASHTO HS20-44 loading.

2.05 MANHOLE RUNGS

a. Each manhole shall be provided with 14-inch wide steps of steel reinforced copolymer plastic seven-eights of an inch (7/8") square set in place on the inside of the manhole beginning two (2) feet above the bottom, and spaced not more than twelve (12) inches to center, as shown on the Drawings. Steps shall be constructed to the dimensions shown on the Contract Drawings and shall be properly embedded in the wall.

2.06 <u>NON-SHRINK, WATER-PROOF GROUT</u>

a. Non-shrink, water-proof grout shall be Hallemite; Waterplug; Embeco; or equal

PART 3: EXECUTION

3.01 INSTALLATION OF NEW STRUCTURES

- a. Precast base sections shall be installed on a crushed stone or concrete foundation mat as indicated on Drawings. The bell of the manhole base shall be wiped clean, be free of all dirt and grit, and liberally soaped in preparation for receiving the riser, cone or slab top section. Prior to snapping the gasket onto the spigot groove of the riser or cone section, the gasket should be wiped clean and well soaped. A screw driver or hammer handle inserted beneath the gasket and run around the pipe will insure even seating. The riser or cone section with gasket in place should then be lowered into the bell of the manhole base, taking care that no dirt gets into the joint or on the gasket. Additional riser or cone sections should be joined in a similar manner.
- b. All pipes or castings to be embedded in masonry work shall be accurately set, brick headers shall be laid around the pipe so embedded. Spurs or stubs for branch sewers shall be built in the manholes where shown on the Plans or otherwise required by the Engineer. They shall be closed with brick masonry or PVC plugs. Precast grade rings and manhole bricking shall not be used for grade adjustments of more than four (4)

inches.

- c. Flexible sleeves and stubs for future use shall be furnished as indicated on the Drawings. A two (2) foot length of pipe of the type and size indicated with end cap shall be installed in the sleeve. Plaster shall be troweled to a smooth, hard finish, and no backfill shall be placed until mortar has thoroughly hardened.
- d. Install the precast sections in a manner that will result in a watertight joint. Seal the joints of precast concrete barrel sections with the preformed flexible joint sealant used in sufficient quantity to fill 75% of the joint cavity. Fill the outside and inside precast section joints with non-shrink grout and finish flush with the adjoining surfaces. Plug holes in the concrete barrel sections required for handling or other purposes with a non-shrink, water-proof grout or concrete and rubber plugs, and finish flush on the inside. Upon completion, all debris shall be removed from manholes and catch basins.
- e. Steel reinforced copolymer polypropylene plastic steps shall be press fitted by hand driven hammer into preformed holes in cured precast sections, on 12-inch centers, by the precast concrete manufacturer.

3.02 BREAKING INTO EXISTING STRUCTURES

- a. General: Core drill into existing structures in such a fashion as to make an opening of suitable size to accommodate the connecting pipe without excessive damage to the existing structure
- b. Manholes: For manholes, break out and rebuild existing inverts as required to provide an adequate base under the new channels being installed, and shaped to provide smooth continuous hydraulic flow through the manhole. Control existing flows as required during the period of construction. No sewage or drainage will be permitted to flow directly against concrete or other masonry work until it is at least 48 hours old.
 - 1. Temporary handling of sewage or drainage flows may be accomplished by inserting pipes from the inlet to the outlet of the manhole and by using temporary plugs, where appropriate, provided that such pipes do not interfere with satisfactory completion of the work and shaping of the inverts, nor cause excessive backing-up in the existing system upstream of the diversion. In cases where this type of temporary handling of flows is not possible, provide the necessary dams, plugs, etc., as required in upstream manholes, and pump the flow around the structure under construction.
 - 2.
 - 3. When sewage is pumped or otherwise diverted around a particular structure, it shall be discharged back into the sewage system through existing downstream manholes. Under no circumstances shall sewage be permitted to run onto the surface of the ground
- c. Catch Basin: All catch basin openings, created as a result of the removal and replacement of the existing drains connected to the catch basins with new drain pipes, shall be sealed. This work shall be performed using masonry to match existing construction, where applicable, and non-shrink grout to provide a neat patch.
- d. Pipe Connections: Rebuild and tightly close existing manhole walls and inverts and catch

basin walls to provide an integral, water-tight structure around the new pipes.

END SECTION

SECTION 02740 ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. The Contractor shall furnish all labor, materials, equipment and such additional work as may be required for temporary (Dense Graded Aggregate (DGA) base course, Hot Mix Asphalt (HMA) base course and HMA intermediate course pavement restoration as described herein and detailed within the Drawings and as described under this Section of the Specifications. HMA and bituminous concrete have the same meaning
- b. The Contractor shall file all necessary applications and obtain all necessary permits (Municipal road opening and grading, etc.) from the various County and municipal offices involved and shall comply with all rules and regulations governing road openings in these roads. The cost of permit fees, bonds, restoration guarantees, and inspection fees shall be included in the various prices bid for roadway restoration.
- c. All work performed and materials furnished shall conform to the lines, grades, cross-sections, dimensions, details, gradation and physical requirements indicated on the Drawings and as called for in the Specifications.
- d. The limits of temporary asphalt restoration shall be as detailed within the Drawings and as required by the local authority having jurisdiction over the section of asphalt surface disturbed.

1.02 <u>GENERAL REQUIREMENTS – ASPHALT PAVEMENT</u>

- a. Perform Work in accordance with The Commonwealth of Massachusetts, Massachusetts Highway Department, "Standard Specifications for Highways and Bridges," 1988 Edition as amended in 2019.
- b. All existing pipelines and services shall be maintained or, where required, shall be removed and replaced to accommodate the work to be done under this Contract.
- c. The Contractor during all phases of his work shall carefully protect all existing structure, pipelines, drains, conduits, or other improvements on the site, and shall restore same to a condition equivalent to conditions existing prior to his operations. Ample precautions shall be taken to prevent settlement of existing improvements.
- d. Placement of temporary pavement shall be completed weekly, unless otherwise approved by the Owner and Engineer. Placement of permanent pavement restoration shall be deferred a minimum of 90 days to allow for sufficient settlement.
- e. Excavation required after backfill has settled, prior to placing the base, shall be made neatly so as to minimize damage to the existing pavement.
- f. Any damage to the portion of the pavement outside the limits of the pavement pay width, which in the opinion of the Engineer, has been caused by negligence of the Contractor, his workmen or agents, shall be repaired in a manner satisfactory to the Engineer, by and at the expense of the Contractor.

- g. All pavement restoration and curbing and sidewalk restoration shall be done in strict accordance with the general requirements of the entity having jurisdiction over the disturbed roadway, and it shall be the Contractor's responsibility to ascertain any specific requirements other than those denoted. The Contractor shall file application for a permit for road opening with the Town of West Springfield prior to the start of construction.
- h. Maintain pavement under this Contract during the guarantee period of one year and promptly (within 24 hours of notice given by the Engineer) refill and repave areas which have settled or are otherwise unsatisfactory for traffic.
- i. All pavement thicknesses referred to herein are compacted thicknesses. Place sufficient mix to ensure that the specified thickness of pavement results.
- j. When the air temperature falls below 50°F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.
- k. Regardless of temperature, paving will not be allowed after October 31 or before May 1 of any year, unless otherwise approved by the Engineer.
- 1. Contractor shall provide and maintain temporary paving for disturbed areas on Brush Hill Avenue, Piper Road, and Birnie Avenue by September 14, 2020. Work on Brush Hill Avenue, Piper Road, and Birnie Avenue will not be allowed from September 14, 2020 to October 5, 2020.

1.03 <u>SUBMITTALS</u>

a. Submit material specifications and shop drawings for all materials furnished under this section.

PART 2 - <u>PRODUCTS</u>

2.01 DENSE GRADED AGGREGATE BASE COURSE

- a. This work shall consist of subgrade preparation and the installation of 12-inch thick layer of dense graded aggregate base course wherever bituminous paving is disturbed.
- b. Spreading equipment shall include an aggregate spreader that can be adjusted to spread to the specified depth, without segregation, and one or more motor graders. The compaction equipment shall be pneumatic-tired rollers, dynamic compactors, and steel wheel rollers.

2.02 HOT MIX ASPHALT (HMA)

a. Hot Mix Asphalt materials shall meet the requirements of M3.11.0 of The Commonwealth of Massachusetts, Massachusetts Highway Department, "Standard Specifications for Highways and Bridges," 1988 edition, as amended. Only Performance Graded Asphalt Binder grades PG 64-28 or PG 52-34 will be used as modifiers and shall meet the requirements of AASHTO M 320.

2.03 <u>REFLECTIVE LONG-LIFE EPOXY RESIN TRAFFIC STRIPES</u>

- a. In accordance with The Commonwealth of Massachusetts, Massachusetts Highway Department, "Standard Specifications for Highways and Bridges", 1988 Edition, as amended, pavement marking paint shall conform to the requirements of Articles M.7.01.10 and M.7.01.11 for waterborne pavement marking paint. The Contractor shall replace-in-kind the white and yellow long-life epoxy resin traffic paint on bituminous concrete immediately after placement of temporary asphalt. The following additional pavement marking paint requirements shall be met:
 - 1. The total nonvolatile content shall not be less than 70% by weight.
 - 2. Pigment shall be 45-55% by weight.
 - 3. Weight per gallon shall not be less than 12.5 pounds.
 - 4. Drying time to no pickup shall be 15 minutes.
- b. No reflective glass beads will be required, and the material shall not lift from the pavement in the freezing weather, and shall not smear or spread under normal traffic conditions or at temperature below 120 degrees F. The paint shall not deteriorate by contact with sand, sodium, chloride, calcium chloride or other chemicals used against the formation of ice on the pavement, because of the oil content of pavement materials, or from gasoline, grease and oil drippings from vehicles.

PART 3 - EXECUTION

3.01 TEMPORARY HMA TRENCH REPAIR IN ROADWAYS

- a. Sawcut the existing pavement in the vicinity of the work to prevent damage to the pavement outside of the specified paylines and/or the requirements of construction. Sawcut shall be straight and neat in appearance.
- b. Immediately after completing the backfill, or in no event later than the end of the work day, place and compact a 12-inch gravel subbase in 2 even lifts to a point 2-inches below the adjacent grade.
- c. All pavement edges that have been damaged shall be sawcut to re-establish a straight clean line between the existing pavement and trench patch.
- d. All structures shall be set to the existing roadway elevations.
- e. The edges of the existing pavement where the joints are to be formed shall be thoroughly coated with tack coat to ensure adhesion between the two pavements.
- f. A 2-inch thick bituminous concrete top course shall then be placed and compacted so that the upper surface provides the proper cross-section.
- g. The Contractor shall maintain all patch areas by filling any holes that may develop and by adding additional bituminous material to maintain the surface of the trench even with the adjacent pavement.

3.02 PREPARATION OF SUBGRADE

a. Before the placing of any aggregate base, the subgrade shall be shaped and compacted to within a tolerance of plus or minus ¹/₂-inch of grade and contour, with no areas

consistently high or low, and shall be free from water pockets. Base material shall not be placed on soft, muddy, or frozen areas, or until all irregularities in the prepared areas, including soft areas in the foundation, have been corrected.

b. Roadbed and embankment sub-grade material shall be compacted to not less than 95% of modified proctor density.

3.03 <u>COMPACTION OF SUBGRADE</u>

- a. Compaction of each layer shall continue until the material complies with the compaction acceptance testing.
- b. Compaction shall progress gradually from the sides to the center with each succeeding pass uniformly overlapping the previous pass and shall continue until the entire area is shaped and compacted.
- c. Unstable base conditions, including soft foundation areas which develop before or ahead of the base course or paving conditions, shall be corrected by scarifying, reshaping, and recompacting, or by replacement as required. Work may be suspended to permit such areas to stabilize.

3.04 <u>CONSTRUCTION OF BASE COURSE</u>

- a. The base material shall be deposited on the prepared areas as uniformly as possible to avoid segregation.
- b. The entire area requiring the dense graded aggregate shall be boxed out and excavated to the depth required.
- c. Material shall not be placed when the subgrade or base material is frozen or when it is unstable because of excessive moisture.
- d. Following the specified boxing out and excavation, the entire area shall be graded and shaped to a smooth uniform subgrade, free of water pockets, and conforming to the grade and crown shown on the Documents.
- e. The base shall be spread with mechanical spreaders except in limited or restricted areas.
- f. Upon the completion of the grading and shaping of the installed dense graded aggregate base course, the entire area shall be thoroughly compacted and rolled. In no case will HMA be placed until the gravel base is dry and compacted to at least 95% maximum density at optimum moisture content.
- g. Prior to any paving activities, the Engineer shall witness and approve a proof roll of the compacted subgrade or aggregate base course material. Unstable base material or subgrade conditions, including soft foundation areas, shall be corrected by scarifying, reshaping, and recompacting, or by replacement as required. Work may be suspended to permit such areas to stabilize.

3.05 PREPARTION AND APPLICATION OF HOT MIX ASPHALT

a. Preparation of Existing Pavement

- 1. Hot mix asphalt (HMA) shall be milled to the specified depth, profile and cross slope using automatic grade controls to control the line and grade of the milling machine.
- 2. Milling operation, including removal of the milled material, shall be performed in a manner that prevents dust and other particulate matter from escaping into the air.
- 3. Every 2- feet the depth of milling shall be checked to verify it is within ¹/₄ inch of the indicated depth.
- 4. The underlying HMA shall not be damaged during milling. If the HMA below the specified milling level becomes dislodged or delaminated, it shall be removed and replaced.
- 5. The milled area shall be cleaned prior to opening to traffic and before resurfacing or subsequent construction using a mechanical sweeper.
- b. Weather Limitations
 - 1. HMA mixtures shall be placed when the combinations of lift thickness and base surface temperatures are within the limits shown in the below table, when it is not raining, and when the base is in a satisfactory condition. For other than surface courses, in case of sudden rain, the placing of mixture then in transit from the plant may be permitted, if laid at proper temperature, and if the base is free of pools of water. Such permission shall in no way waive any of the requirements of the specification.
 - 2. Base temperature will be measured on the surface on which the lift will be placed. Lift thickness will mean the compacted lift thickness

Lift Thickness (Inches)	Minimum Base Temperature (°F)
<u><</u> 1	50
$\overline{1}$ to 2	41
> 2	32

- 3. If the mix contains modified binder, the minimum base temperature shall be 50 °F, regardless of lift thickness.
- c. Preparation of DGA Base Course
 - 1. The preparation the dense graded aggregate base course shall be in accordance with the requirements of Section 3.01 of this specification and each shall be checked and approved far enough in advance of spreading the HMA base mixture to permit one (1) day's paving operations.
- d. Conditioning of Existing Surface
 - 1. The surface upon which the HMA is to be placed shall be clean of all foreign and loose material and be dry and free from ice when the paving operations are about to start, and the surface shall be maintained in that condition.

- 2. In areas where the distributor spray bar cannot reach, the use of hand spraying equipment will be permitted for tack and prime coat.
- 3. Treatment of the pavement surface shall conform to the following:

<u>Tack Coat</u>: When HMA is placed on existing HMA, or newly constructed HMA on which traffic has been maintained, the paved surface shall be given an application of tack coat material, uniformly sprayed. The application is not acceptable if the material is streaked or ribboned. The edges of the existing pavement where the joints are to be formed shall be thoroughly coated with tack coat to ensure adhesion between the two pavements. The contact surfaces of curbs, castings, and other structures shall be painted with a tack coat prior to placement of paving. The tack coat shall be RS-1 emulsion and shall be applied at a rate of 0.05 gallons per square yard on binder courses and streets to be overlayed.

- 1. Before paving, sufficient time shall be allowed to permit the tack coat to cure to a condition, which is tacky to the touch.
- 2. All uncoated or lightly coated areas shall be corrected. All areas showing an excess of bituminous material shall be blotted with sand or other similar material. Blotting material shall be removed before paving. No more tack coat should be applied than can be covered in the same day. Traffic control shall be provided to prevent vehicles from riding on surfaces upon which tack coat has been applied.
- e. Spreading and Grading
- 1. The mixtures shall be laid upon an approved surface, spread, and struck off to the grade and elevation required. HMA pavers shall distribute the mixture either over the entire width or over such partial width as may be practicable. Paving courses shall be constructed in layers not less than 3 nor more than 5 times the nominal maximum aggregate size of the HMA mixture being constructed.
- 2. On areas of irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, and luted by hand tools. For such areas, the mixture shall be dumped, spread, and screeded to give the required compacted thickness. If it is determined that the underlying material has not been compacted and finished to the specified thickness or grade, construction of any subsequent course shall not proceed until corrective measures have been completed.
- 3. The longitudinal joint in one (1) layer shall offset that in the layer immediately below by approximately 6-inches. However, the joint in the surface course shall be at the lane lines.
- 4. Transverse joints shall be carefully constructed and thoroughly compacted to provide a smooth riding surface.
- f. Compaction
- 1. After the HMA has been spread, struck off, and surface irregularities adjusted, it shall be compacted thoroughly by steel-wheeled rollers of sufficient weight to compact the HMA

to 95% of the calculated Theoretical Maximum Density (TMD) in accordance with ASTM D2041.

2. The surface shall be rolled when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Rolling shall begin at the sides and progress gradually to the center.

Laydown Rate (r), yd ² /day	Minimum Number of Rollers
r ≤ 2000	1
2000 < r < 4000	2
$r \ge 4000$	3

3. Compact with the minimum number of rollers as specified in the table below:

- 4. Orient the drive axles of the roller towards the paver during compaction operation. Operate rollers at a slow, uniform speed not exceeding 2-1/2 miles per hour. If necessary, to prevent adhesion of the HMA to the rollers, keep the wheels moistened with water mixed with very small quantities of detergent.
- 5. Begin compacting at the sides and progress gradually to the center. On superelevated curves, compact from the lower to the upper edge parallel to the centerline and uniformly overlap each preceding track until the entire surface has been compacted.
- 6. Continue rolling until roller marks are eliminated and the air voids conform to the specified requirements. Top course mixes shall provide for 4% air voids in the finished product. The initial in-place voids shall not exceed 7.5%. Final in-place voids shall not be below 2.5%. Additional asphalt content shall not be added for the sole purpose of reducing the in-place voids. If the in-place voids are too high or the paving is expected to occur during cold weather, more compactive effort will be required to adjust the void content rather than increasing the asphalt content
- 7. Along forms, curbs, headers, walls, and other placed not accessible to the rollers, compact the HMA by a vibratory drum compactor.
- 8. Remove and replace HMA that becomes loose, broken, or otherwise defective or that shows an excess or deficiency of asphalt binder material.
- 9. When paving in echelon, keel the rollers for the first lane approximately 6 inches from the unconfined edge adjacent to the second paving operation. After HMA from the second paver is placed against the uncompacted edge of the mat from the first paver, compact the HMA on both sides of the joint.
- 10. Prevent lateral or vertical displacement of the unconfined edge during the compaction operation. Ensure that the edge of the drums of the rollers extends over the free edge of the mat by at least 6 inches.
- 11. When compacting the butt or wedge joint, while paving the adjacent lane, place the roller on the newly placed HMA and overlap the joint by approximately 6-inches.
- 12. If a test strip was not required, establish a correlation between the nuclear density gauge and the cores. To adjust correlation with the thin lift nuclear density gauge, take 1 additional core every week during the paving operation. The Engineer may approve

additional coring with valid cause presented by the Contractor. On a weekly basis, provide results of both the nuclear density and core testing to the Engineer. Provide core and nuclear density results that include the bulk specific gravity, the maximum specific gravity according to AASHTO T 209, and the percent air voids. Failure to submit the core and nuclear density test results from the previous week's paving will result in suspended paving operations.

- g. Opening to Traffic
- 1. Remove loose material from the traveled way, shoulder, and auxiliary lanes before opening to traffic. Open HMA courses to traffic or construction equipment, including paving equipment, only after the surface temperatures meet is less than 140 °F.

3.06 <u>APPLICATION OF TRAFFIC STRIPING</u>

- a. Protect the building, walks, pavement, curbing, trees, shrubs, mulch, etc. from over-spray of paint and damage.
- b. Immediately before striping the pavement surface, clean the surface of dirt, oil, grease, and foreign material, including curing compound on new concrete. Clean the surface 2-inches beyond the perimeter of the stripes to be placed.
- c. Application of markings shall not proceed until authorization is received from Engineer.
- d. Bituminous concrete pavements shall have been in place for at least 7 days prior to the application of pavement markings. Painting shall be in accordance with Section 860 of the Massachusetts DPW "Standard Specifications for Highway and Bridges", 1988 Edition, as amended
- e. Mix epoxy resin with an automatic proportioning and mixing machine, and hot-spray the compound at a temperature of between 100 and 130 °F onto dry surfaces. Apply the compound with a wet film thickness of 20 ± 1 mil. Apply the material during dry weather conditions when the ambient temperature is a minimum of 45 °F and the surface temperature is a minimum of 50 °F. Adjust operations as required for the prevailing ambient and surface conditions to achieve a no-track drying time of 30 minutes or less.
- f. All stripes shall be applied one coat with brush, spray or marking machine over dry clean pavement only.
- g. All paint shall be installed at a rate of not more than 300 linear feet of 4- inch wide lines per gallon of paint (approximately 0.016 inch dry film thickness).
- h. Remove all compound that has been tracked or spilled outside of the intended placement areas.
- i. If the Engineer determines, based upon calculated and measured yields, that the striping has a wet film thickness of less than 19-mils, restripe the entire length with 20-mils of new compound.
- j. Replace the entire length of striping where improper curing or discoloration has occurred. Discoloration is localized areas or patches of brown or grayish colored compound. Where

improper curing or discoloration occurs intermittently in intervals of 100-feet or less throughout the striping length, replace the entire length of striping from the beginning of the first occurrence until the end of the last occurrence, plus 5-feet on each end.

- k. Replace the entire length of striping that has failed to bond to the pavement, or has chipped or cracked. Where more than 25-spots of chipping, cracking, or poor bonding have occurred within 1,000-linear feet of striping, replace the entire 1,000-foot length of striping.
- 1. Complete each application of all types of traffic stripes and allow to thoroughly dry before opening to traffic. Precautions shall be taken to prevent tracking by tires of the striping equipment. Traffic cones used for protection of markings shall be not less than 28 inches in height.
- m. At a minimum, delineate center lines on undivided roadways and broken lines between lanes before the traveled way is opened. The Engineer will determine when the traveled way can be opened to traffic.

END OF SECTION
SECTION 02770 SIDEWALK AND CURBING

PART 1: <u>GENERAL</u>

1.01 SCOPE OF WORK

a. Contractor shall furnish all labor, materials, and equipment and such additional work as may be required for sidewalk and curbing replacement as ordered by the Engineer. The Contractor shall perform all excavation required for replacement of sidewalks and curbs.

1.02 <u>RELATED SECTIONS</u>

- a. Section 02740 Asphalt Pavement
- b. Section 03005 Structural Concrete

PART 2: <u>PRODUCTS</u>

2.01 <u>GENERAL REQUIREMENTS</u>

- a. The Contractor shall be completely responsible for replacing damaged sidewalk and curbing caused by his operations. Replacements are to be made promptly upon notification of damage and conform to criteria contained in this section of the Specifications.
- b. Replacement of damaged sidewalk and curbing shall be deferred a minimum of 90 days to allow for sufficient settlement.

2.02 <u>CONCRETE</u>

a. Where existing sidewalks must be replaced, workmanship, dimensions and materials shall conform to existing sidewalks and shall be in accordance with the detail shown on the Drawings. Minimum standards shall be a 4-inch thickness of 4,500 psi concrete. Sidewalks crossing driveways and concrete driveway aprons shall be 6-inch thick with welded wire mesh. Concrete shall be provided on accordance with the requirements of Section 03005, Structural Concrete.

2.03 HOT MIX ASPHALT (HMA)

a. Where existing asphalt sidewalks must be replaced, workmanship, dimensions and materials shall conform to existing sidewalks and shall be in accordance with the detail shown on the Drawings. Minimum standards shall be 2-inch layer of dense graded aggregate and a 1.5-inch layer of HMA surface course. HMA shall be provided in accordance with the requirements of Section 02740, Asphalt Pavement. Asphalt sidewalks crossing driveways and driveway aprons shall be in accordance with "Driveway Apron Replacement" Detail.

PART 3: EXECUTION

3.01 SIDEWALK AND DRIVEWAY TRENCH REPAIRS AND PREPARATION

a. Sawcut the existing pavement or concrete in the vicinity of the work to prevent damage outside of

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the specified paylines and/or the requirements of construction. Sawcut shall be straight and neat in appearance.

- Immediately after completing the backfill, or in no event later than the end of the work day, place and compact a 12-inch gravel subbase in 2 even lifts to a point 2-inches below the adjacent grade. The Contractor will be allowed to backfill trenches to grade with gravel during the work week, but will be required to install the pavement on these trenches by the end of the work week.
- c. A 2-inch thick bituminous concrete top course shall then be placed and compacted so that the upper surface provides the proper cross-section for the sidewalk or driveway. Until such time that the final driveway replacement or sidewalk repair is completed, the Contractor shall maintain all temporary patch areas by filling any holes that may develop and by adding additional bituminous material to maintain the surface of the trench even with the adjacent sidewalk or driveway.
- d. After the 90-day settlement period, permanent repairs to bituminous concrete driveways, bituminous concrete sidewalks, and concrete sidewalks or driveways may be completed.

3.02 CONCRETE SIDEWALK AND DRIVEWAY REPLACEMENT

- a. Before sidewalks are replaced, care should be exercised to ascertain that the sidewalks are in the same location and to the same width as those disturbed. An 8-inch broken stone foundation shall be installed under all sidewalk sections. The sub-base shall be adequately prepared and rolled to provide uniform, solid base. The base shall be dampened before concrete is placed. Adequate forms shall be installed before placing concrete and expansion joints shall conform to location of original joints.
- b. After being placed, the concrete shall be tamped, screened and finished to a true grade and surface. The finish shall be with a wood float, followed by brushing with a wet soft haired brush to a neat and workmanlike manner. Exposed edges shall be neatly rounded to a radius of 1/4-inch and the concrete adequately cured immediately after placing. Walks shall not be patched, but all slabs damaged or removed shall be replaced with a new sidewalk.

3.03 ASPHALT SIDEWALK AND DRIVEWAY REPLACEMENT

a. Before sidewalks are replaced, care should be exercised to ascertain that the sidewalks are in the same location and to the same width as those disturbed. An 8-inch dense graded aggregate foundation shall be installed under all asphalt sidewalk sections. The sub-base shall be adequately prepared and rolled to provide uniform, solid base. Walks shall not be patched, but all sidewalks damaged or removed shall be replaced with a new full section of asphalt sidewalk.

3.04 CURB REPLACEMENT

a. Curbing shall be replaced where existing curb has been removed or disturbed. New sections of curbing shall be installed between expansion joints in the existing curb. New curbing materials shall be of the type removed or disturbed.

3.05 CARE AND RESTORATION OF PROPERTY

a. All sidewalks, driveways and curbs which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations. Suitable materials and methods shall be used for restoration of

curbs and other types of curbs, driveways and sidewalks.

b. Materials and methods for all restoration shall be subject to approval by the Engineer.

3.06 LIMITATIONS ON PRODUCT USE

a. No materials shall be placed on frozen or untamped subgrades.

* * *END OF SECTION* * *

SECTION 02820 FENCING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- a. Contractor shall provide all labor, materials and equipment necessary to complete installation of both temporary fencing required during construction and the installation of new permanent fencing, complete. In general, the type of fencing and gating shall be polymer coated chain link fabric with polymer coated steel framework and accessories. To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source. ASTM current specification and tolerances apply and supersede any conflicting tolerance.
- b. The following Standard Specifications and Codes shall be considered a part of this specification where such specifications are applicable, and shall include all current changes and revisions:
 - 1. All applicable local and national building codes.
 - 2. American Society for Testing and Materials.
 - 3. ASTM F 567-93, Standard Practice for Installation of Chain-Link Fence.

1.2 **DEFINITIONS**

- a. CLFMI: Chain Link Fence Manufacturers Institute.
- b. Zn-5-Al-MM Alloy: Zinc-5 percent aluminum-mischmetal alloy.

1.3 <u>SUBMITTALS</u>

- a. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
- b. Shop Drawings: Show locations of fence, each gate, posts, rails, and tension wires and details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.

1.4 QUALITY ASSURANCE

a. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- b. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.
- c. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 – <u>PRODUCTS</u>

2.1 <u>AMERICAN IRON AND STEEL REQUIREMENT</u>

a. All iron and steel products included in this section shall be manufactured in the US. Refer to Section 00800 for further description of the American Iron and Steel requirement

2.2 <u>MANUFACTURERS</u>

- a. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- b. Polymer coated chain-link fencing and accessories.
 - 1. Ameristar Fencing Products.
 - 2. Or Equal

2.2 <u>CHAIN-LINK FENCE FABRIC</u>

- a. Steel Chain-Link Fence Fabric: Provide fabric fabricated in one-piece widths for fencing in height of 12 feet and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
 - 1. Mesh and Wire Size: 1-inch mesh, 0.148-inch 9 gauge core wire.
- b. PVC-Coated Fabric: ASTM F 668. Class 2b (thermally fused and bonded) over metallic coated steel wire, PVC Coating to be not less than 10-mil. thick.

Color: Black.

- c. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.
- d. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

- a. Round Steel Pipe: Cold-formed, electric-resistance-welded steel pipe. Comply with ASTM F 1043, Material Design Group IC, with minimum yield strength of 50,000 psi; and the following external and internal coatings and strength and stiffness requirements:
 - 1. Coatings: Protective coatings per ASTM F 1043. External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil. thick, zinc pigmented coating.

- b. Polymer Coated Framing: The material used to manufacture frame-work for color chain link fencing systems shall be galvanized sheet steel, in coils, meeting the general requirements of Specification ASTM A924 and the specific product requirements of Specification A653, Quality level HSLA (high-strength, low-alloy). Type I, Grade 50, Coating Designation G-90 (.90 oz/ft²), Hot Dip Process. The framework shall be manufactured in accordance with commercial standards to meet the strength requirements (55,000 psi minimum yield strength) of Specification ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe. The manufactured framework shall be subjected to a complete thermal stratification coating process (multi-stage, hightemperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The material used for the base coat shall be a zinc-rich (gray color) thermosetting epoxy: the minimum thickness of the base coat shall be 2 mils. The material used for the finish coat shall be a thermosetting "no-mar" TGIC polyester powder: The minimum thickness of the finish coat shall be 2-3 mils. The stratification coated framework shall demonstrate the ability to endure a salt spray resistance test conducted in accordance with ASTM B117 Test Method without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated framework shall demonstrate the ability to withstand exposure in a weatherometer apparatus for 1,000 hours without failure in accordance with Practice ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in Test Method ASTM D3359. The polyester finish coat shall not fade, crack, blister or split under normal use.
- c. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.
- d. Top Rails: Fabricate top rail from lengths 21 feet or longer, with swedged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric, as shown on drawing or as specified.
- e. Intermediate Rails: Match top rail for coating and strength and stiffness requirements.

2.4 <u>FTTINGS</u>

- a. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.
 - 1. Steel and Iron: Unless specified otherwise, hot-hip galvanized pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
 - 2. Supplemental Color Coating: In addition to above metallic coatings, provide Polymer coated finish to match fence framing on all fence fittings. Polymer coating to comply with coating specified below. Color to match chain link fabric.
- b. B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post.
 - 1. Provide line post caps with loop to receive tension wire or top rail.

- c. C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.
- d. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Hot-dip galvanized pressed steel or round steel tubing. Not less than 6 inches long.
 - 2. Rail Clamps: Hot-dip galvanized pressed steel. Provide line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line to line posts.
- e. Tension and Brace Bands: Hot-dip galvanized pressed steel.
- f. Tension Bars: Hot-dip galvanized steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- g. Truss Rod Assemblies: Hot-dip galvanized steel rod and turnbuckle or other means of adjustment.
- h. Tie Wires, Clips, and Fasteners: Provide the following types according to ASTM F 626:
 - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - 2. Hot-Dip Galvanized Steel: 0.106-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric. PVC Coating (Tie wires): Not less than 10-mil (0.254-mm) thick PVC.

2.5 <u>GROUT AND ANCHORING CEMENT</u>

a. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

2.6 <u>POLYMER FINISHES</u>

- a. Supplemental Color Coating: In addition to specified metallic coatings for steel, provide fence components with polymer coating.
- b. Metallic-Coated Steel Framing: Comply with ASTM F 1043 for polymer coating applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces.
 - 1. Polymer Coating: Not less than 3-mil- thick polyester finish.
- c. Fittings, Post and Line Caps, Rail and Brace Ends, Top Rail Sleeves, Tension and Brace Bands, Tension Bars, Truss Rod Assemblies, Tie Wires, Clips, and Fasteners: Comply with ASTM F 626 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.
 - 1. Polymer Coating: Not less than 3-mil thick Polyester finish.
- d. Color: Black.

2.7 <u>GATES</u>

- a. Gates shall meet the material and finish requirements of chain-link fencing.
- b. Gates shall be of the type and dimensions as indicated on Drawings.

PART3 – <u>EXECUTION</u>

3.1 <u>EXAMINATION</u>

- a. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed.
- b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **PREPARATION**

a. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- a. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
- b. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
- c. Post Setting: Hand or mechanically excavate holes for post foundations in firm, undisturbed or compacted soil. Set terminal, line, and gate posts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
 - 1. Dimensions and Profile: As indicated on Drawings.
 - 2. Concealed Concrete Footings: Stop footings 2 inches below grade as indicated on Drawings to allow covering with surface material.

3.4 CHAIN-LINK FENCE INSTALLATION

- a. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- b. Line Posts: As indicated on Drawings.
- c. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull

posts. Locate horizontal braces at mid height of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

- d. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.
- e. Intermediate Rails: Install in one piece at locations indicated on Drawings, spanning between posts, using fittings, special offset fittings, and accessories.
- f. Chain-Link Fabric: Apply fabric to inside (field side) of enclosing framework. Leave one (1") inch between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- g. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
- h. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails with both ends twisted two (2) full turns. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to braces 18 inches o.c.
 - 2. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Cut off excess bolt length (max two (2) threads exposed), peen ends of bolts or score threads to prevent removal of nuts. Coat cut ends, nuts and exposed bolts with rust inhibitive paint to match fence color.

3.5 <u>GATE INSTALLATION</u>

a. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 <u>ADJUSTING</u>

a. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION

SECTION 02900 LAWNS, GRASSES, TREES, AND SHRUBS

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. The work included in this section shall cover the stripping, stockpiling and replacement of any existing topsoil throughout the site, the furnishing and placement of additional topsoil as required to provide a 6-inch covering throughout the area to be grassed, and restoration of disturbed areas to their original condition.
- b. The Contractor may furnish and place sod in lieu of providing seed at no additional charge to the Owner.
- c. Topsoil, if any, taken from original excavations shall be carefully and separately stored, and after completion of the rough grading, shall be spread, graded, and rolled to conform with the elevations shown on the Drawings. Additional topsoil, as required, shall be furnished by the Contractor at no additional cost. A minimum thickness of topsoil of six (6) inches will be required in all areas to be seeded.
- d. Trees and shrubs within construction easements, which are not required to be removed to permit construction, shall be protected to the drip line with appropriate protection measures such as snow fencing or batter boards.
- e. Place seed only between the periods from April 15 to June 1, and from August 15 to October 1, unless otherwise approved by the Engineer.

1.02 <u>SUBMITTALS</u>

- a. Lawn seed mixture including percent by weight of each seed type, and manufacturer/Supplier name.
- b. Suitable laboratory analysis of the topsoil to determine the quantity of fertilizer and lime to be applied.
- c. Lime and starter fertilizer application rates based on laboratory soil tests.
- d. A sworn certificate indicating each variety of seed, weed content, germination of seed, net weight, date of shipment and manufacturer's name shall accompany each seed shipment.

1.03 <u>WARRANTY</u>

- a. Plants shall be true to botanical name and size, and in vigorous healthy growing condition.
- b. Plants shall be guaranteed for 1 year from date of original or replacement installation.

PART 2 - PRODUCTS

2.01 <u>LOAM</u>

- a. Loam from offsite, as required for Work, shall be taken from a well-drained, arable site, and shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Loam shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Loam shall not be delivered or used for planting while in a frozen or muddy condition. Topsoil as delivered to the Site or stockpiled shall have pH between 6.0 and 7.0 and shall contain not less than 5 percent or more than 8 percent organic matter as determined by loss of ignition of moisture-free Samples dried at 100 degrees Celsius.
- b. Onsite loam may be available from stripping of onsite topsoil. Onsite topsoil shall be tested as specified below and shall be amended as necessary to meet Specification requirements for loam.
- c. Soil Analysis: The Contractor shall submit representative Samples of loam, which he intends to bring onto the Site, and Samples of loam from onsite sources, to a Soil and Plant Testing Laboratory acceptable to the Engineer. All reports shall be sent to the Engineer for approval. Samples of loam to be brought to the Site must be approved prior to delivery of soil. Deficiencies in the loam shall be corrected by the Contractor, as directed by the Engineer after review of the testing agency report by a soils consultant. Testing reports shall include the following tests and recommendations.
 - 1. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System.
 - 2. The silt clay content shall be determined by a Hydrometer Test.
 - 3. Percent of organics shall be determined by an Ash Burn Test or Walkley/Black Test.
 - 4. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH).
 - 5. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular lawn and planting objectives noted.
 - 6. All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists.
- d. Loam for General Lawn and Site Restoration Areas: Loam shall conform to the following grain size distribution for material passing the #10 sieve:

	Percent Passing	
U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	84	100

35	63	72
140	26	40
270	22	34
0.002 mm	2	5

1. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6 or less (D80/D30 < 6).

- 2. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
- 3. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

2.02 SAND AND AMENDENT

a. Sand to be mixed with topsoil shall meet the following requirements. The material shall be uniformly graded coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation:

	Percent Passing	
U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	60	80
35	35	55
60	8	20
140	0	8
270	0	3
0.002 mm	0	0.3

1. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 10% by weight of the total sample

- 2. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D30) shall be 3.0 or less (D70/D20 < 3.0).
- 3. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

2.03 FERTILIZER AND LIMESTONE

- a. Fertilizer shall be lawn or turf grade, bear the manufacturer's name and guaranteed statement of analysis, and shall be applied in accordance with manufacturer's directions.
- b. Limestone shall be an agricultural type ground limestone, and shall be pelletized type for prolonged time release to soil. Limestone shall be applied in accordance with manufacturer's directions.

2.04 <u>SEED</u>

- a. Seed to be furnished under this section shall be of the previous year's crop.
- b. Seeds shall be 98-percent pure, have more than 80-percent germination, and shall comply with State and Federal seed Laws and Regulations.
- c. The seed shall contain practically no seeds of noxious weeds and shall be delivered mixed in uniform sealed bags showing weights, analysis, and vendor's name.
- d. Grass seed shall conform to the following mixtures in proportion by weight and weed content and shall pass the minimum percentages of purity and germination as indicated for same.

Recreation Mix	Percent Weight
Rebel II Tall Fescue	70
Palmer Perennial Ryegrass	20
Baron Kentucky Bluegrass	10

2.05 TREES AND SHRUBS

a. Trees and shrubs whose removal is necessary to facilitate construction shall either be replanted at the same location or replaced with nursery stock of the same kind.

PART 3 - EXECUTION

3.01 <u>TOPSOILING</u>

- a. Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of soil.
- b. All stockpiled existing topsoil shall be thoroughly cleared of all sticks, roots, branches, coarse sods, and other deleterious matter, and all stones larger than one inch in diameter before it is respread.
- c. New topsoil furnished from sources outside the site shall have a minimum organic content of not less than 2.75 percent by weight which shall be guaranteed by the supplier of the topsoil. New topsoil shall be of good quality and approved by the Engineer. All new topsoil shall be from the same source.
- d. Topsoil shall not be handled or spread when it is in a frozen or muddy condition or otherwise unsuitable for handling.

- e. No topsoil shall be spread before completion of all construction in the area or before all fills are fully stabilized.
- f. Before spreading topsoil, the subgrade shall be cleared of all stones more than two inches in diameter, all coarse roots, sticks, and debris to a depth of 4 inches. Any portions of the subgrade which have been compacted to a hard surface shall be pulverized and cultivated to a depth of four inches by plowing, disk harrowing, or other satisfactory method. Immediately prior to topsoil distribution the surface shall be scarified to provide a good bond with the topsoil.

3.02 <u>SEEDING</u>

- a. All areas to be seeded shall then be fine graded to remove all ridges and depressions, and the surface shall be cleaned of all stones greater than one inch in diameter, and other debris.
- b. After preparation of the seed bed, and at least nine days before seeding, an approved commercial complete fertilizer with a minimum content of 10% nitrogen, 20% phosphoric acid, and 10% potash shall be incorporated into the soil at a rate of 500 lbs/acre to a depth of 4-inches, as detailed in this Section. The soil shall then be thoroughly watered.
- c. Seed shall then be evenly spread and raked into the prepared soil at the rates indicated within the table in Section 2.1. Seed shall be rolled with a water ballast roller and shall be watered, protected by and tended by the Contractor until there is a hardy stand of grass. Areas not thus productive shall be refertilized and reseeded as above until grass is established. All seeded areas shall be immediately mulched with hay uniformly spread in a layer 1 to 1-1/2 inch thick, loose measurement. Hay shall be blown on in its natural length. Chopped hay shall not be used. No seeded areas shall be used during colder months to protect slopes. After mulching, Contractor shall apply mulch binder consisting of one application of a biodegradable, non-phytotoxic tackifier at a rate as recommended by the manufacturer and approved by the Engineer. All mulch shall be left in place to disintegrate except that Contractor shall remove excessive amounts of hay when so directed by the Engineer.
- d. Seeded areas that erode during the Contract period (including the year's maintenance and repair period) shall be repaired and restored by the Contractor in accordance with all provisions of this Section.
- e. Place seed only between the periods from April 15 to June 1, and from August 15 to October 1, unless otherwise approved by the Engineer.

3.03 <u>SODDING</u>

- a. Sodding operations shall not be undertaken until all other construction work and clean-up operations have been completed. Sodding shall be done during time of favorable growing periods such that at least two (2) cutting operations can be undertaken by the Contractor.
- b. Sod shall be placed within 24 hours after stripping and be protected against drying and breaking of the rolled strips.

- c. Sod shall be obtained from a competent nursery man with at least five (5) years' experience. The Contractor shall provide the Engineer with the name of the sod supplier for approval prior to order and placement of such material.
- d. Sod shall be comprised of approximately 25% Kentucky Blue Grass. The balance of the sod shall be comprised of approximately 15% Red Top grass, 45% domestic-grown chewings Fescue, and 15% Astoria Bent. Sod shall be strongly rooted, be not less than two (2) years old, and be free of weeds and undesirable native grasses. All sod shall be capable of growth and development when planted. Sod shall be of uniform thickness, approximately 5/8 inch (excluding top growth) at time of cutting.
- e. No sod shall be placed on frozen ground. All sod shall be supplied in rows of 12" width by 48' in length. Sod shall be placed on the contour such that alternate rows will have staggered joints with all edges butted tight to adjacent sod pieces. Sod shall be lightly tamped or rolled to ensure contact with the subgrade. Broken or torn pads will not be acceptable.
- f. Immediately after placing the sod, the Contractor shall fertilize the sod with 5-10-5 applied at a rate of 600 lbs/acre. Fertilizer shall be combined with a thin layer of topsoil spread evenly over the sodded area to a smooth uniform surface. Along the crown of the slope a capping strip of jute or plastic netting properly secured shall be used to prevent undercutting of the sod. The Contractor is responsible to maintain (cutting, watering, etc.) the lawn until the project completion date and acceptance by the Owner and provide no less than two cuttings.

3.04 <u>TREE REMOVAL</u>

a. In heavily wooded areas, every effort shall be made to avoid the destruction of common native trees and shrubs so as not to unduly disturb the ecological balance or environmental quality of the area. Trees of 12-inch diameter or greater should be preserved whenever possible and protected to the drip line. Where practical, common native trees and shrubs, of 1- through 3-inch caliper, which must be cleared from the construction area shall be stockpiled for use in restoration. Straggling roots shall be pruned. Trees which must be pruned to facilitate construction shall be cut cleanly and painted with tree paint. If a tree not intended to be removed is damaged, the wood shall be repaired according to common nursery practice and painted with tree paint.

3.05 MAINTENANCE (LAWNS & GRASSES)

- a. Maintenance shall include watering, weeding, removal of stones and other foreign objects over one half (1/2) inch in diameter, cutting the grass until final acceptance. Mow at least weekly, removing no more than 30-40 percent of the leaf tissue using well sharpened blades. Mow grass between one (1) and two (2) inches high in the spring and fall. Mowing heights shall be an additional one-half to an inch in the summer to reduce temperature stress. Leave the clippings in place to help recycle essential plant nutrients needed for growth. All bare or dead spots which become apparent shall be properly prepared, re-loamed, limed, aerated, fertilized, and reseeded as many times as necessary to secure a good growth. The entire area shall be maintained, watered and cut until final acceptance of the lawn installation.
- b. The dressed and seeded areas shall be sprinkled with water as necessary from time to time. Signs and barricades should be placed to protect the seeded areas.

- c. To be acceptable, seeded areas shall consist of a uniform stand without bare or dead spots of at least 90 percent established permanent grass species, with uniform count of at least 200 plants per square foot.
- d. The Engineer shall determine whether maintenance shall continue in any part.
- e. After all necessary corrective Work and clean-up has been completed, and maintenance instructions have been received by the Owner, the Engineer will certify in writing the acceptance of the lawns.
- f. Substantial Completion will not be achieved until the seeded areas have demonstrated a satisfactory stand of growth as determined by the Engineer. Seeded areas not demonstrating satisfactory stands as outlined above, as determined by the Engineer, shall be renovated, reseeded and maintained meeting all requirements as specified herein.

3.06 MAINTENANCE (TREES & SHRUBS)

- a. Begin maintenance immediately after planting and continue for 1 year from date all plantings have been installed. Plantings done in late fall after November 1st shall be maintained until the second spring leafing.
- b. Continue the maintenance period at no additional cost to the Owner until all previously noted deficiencies have been corrected, at which time the final inspection will be made.

END OF SECTION

SECTION 03005 STRUCTURAL CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- a. The Contractor shall furnish all labor, equipment and materials required to comply with the intent of the Drawings pertaining to concrete work.
- b. The Contractor shall examine the Construction Site and all substrate and conditions under which the work shall be performed. In the case that there are unsatisfactory conditions, the Contractor shall notify the Engineer in writing. The Contractor is not to proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the Engineer.

1.02 STANDARD REQUIREMENTS

- a. Formwork
 - 1. The design and engineering of the formwork, as well as its construction, are to be the responsibility of the Contractor. All forms are to be tight, adequately constructed, and securely held in place. All forms are to withstand, without deformation, the load of the fresh concrete and the effects of the vibrating process, as well as prevent the leakage of mortar. The alignment of forms is to be carefully undertaken to ensure that the forms are secured to the lines and elevations required. Forms are to be clean and are to be recleaned and repaired for each use. Form surfaces against which concrete is to be placed are to be coated with a nonstaining material to prevent the adhesion of the concrete.
 - 2. Proper safe shoring, reshoring, and time of stripping of forms, plus number, adequacy, size and location of these shores, reshores and forms shall be in accordance with good construction practice and shall be so designed and constructed that all local Codes are adhered to. It shall be the sole responsibility of the Contractor to provide a safe structure at all times, and to provide safety to human life and property.
 - 3. All corners, edges and arises are to be constructed with a ³/₄" chamfer, whether or not shown on the Drawings. Larger bevels and bull-noses shall be constructed as shown. The Contractor is to review the Drawings to determine what other special concrete configurations may be required.
 - 4. Form design, tolerances of finished lines, and camber to compensate for deflections due to the weight of the fresh concrete shall conform to ACI 347, or as otherwise required.
 - 5. The Contractor shall provide all chamfers, bevels, "V" scores, construction and expansion joints, waterstops, recesses, notches, reveals, keyways, reglets, inserts, anchors, depressions, ledges, knock-out panels, and temporary cleanout openings of suitably shaped materials in order to produce the cast-in-place concrete work as indicated on the Drawings.
 - 6. The Contractor shall build into the formwork all plates including sliding plates, floor drains, sleeves, frames, anchors, anchor bolts, shelf angles, flashing, reglets, hangers, recesses, necessary ties, anchors and inserts required to anchor any brick, masonry, precast concrete or other special items.

- 7. All forms shall be arranged with joints either vertical or horizontal and having a uniform spacing. All panel faces shall be as large as possible to reduce the number of form joints. Form ties shall be uniformly spaced. Joints and form ties shall be arranged in a geometric pattern acceptable to the Engineer.
- b. Cast-In-Place Concrete
 - 1. All excavation for foundation elements must be completed and inspected by the Engineer before concrete foundation work for the structure is started.

1.03 <u>REFERENCES</u>

- a. All work performed and materials installed by the Contractor are to be in strict accordance with the latest requirements of the following Codes and Standards:
 - 1. International Building Code, 2015
 - 2. American Concrete Institute
 - a. ACI 117-10 -Specifications for Tolerances for Concrete Construction and Materials and Commentary
 - b. ACI 301-10 Specifications for Structural Concrete
 - c. ACI 304R-00 Guide for Measuring, Mixing, Transporting and Placing Concrete
 - d. ACI 305R-10 Hot Weather Concreting
 - e. ACI 306R-10 Cold Weather Concreting
 - f. ACI 308R-16 Guide to External Curing of Concrete
 - g. ACI 309R-05 Guide for Consolidation of Concrete
 - h. ACI 318-14 Building Code Requirements for Structural Concrete and Commentary
 - i. ACI 347-14 Guide to Formwork for Concrete
 - j. ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures and Commentary
 - k. ACI SP-66 (04) ACI Detailing Manual
 - 3. American Society for Testing Materials
 - a. ASTM A307-14 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
 - b. ASTM A615-16- Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - c. ASTM A1064-16a Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - d. ASTM C33-16 Specification for Concrete Aggregates
 - e. ASTM C39-16 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - f. ASTM C94-16 Specification for Ready-mixed Concrete

- g. ASTM C143-15a Standard Test Method for Slump of Hydraulic-Cement Concrete
- h. ASTM C150-16 Specification for Portland Cement
- i. ASTM C231-14 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- j. ASTM C233-14 Standard Test Method for Air-Entraining Admixtures for Concrete
- k. ASTM C260-10a Standard Specification for Air-Entraining Admixtures for Concrete
- 1. ASTM C309-11 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- m. ASTM C494-15 Standard Specification for Chemical Admixtures for Concrete
- n. ASTM C1202-12 Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- o. ASTM E329-14a Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
- w. ASTM F1554-15- Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength
- 4. Army Corp of Engineers Permeability Testing CRD C48-92
- 5. American Welding Society AWS D1.4 -Structural Welding Code Reinforcing Steel
- 6. Concrete Reinforcing Steel Institute Manual of Standard Practice
- 7. FS-SS-S-201A Sealing Compound for Expansion Joints
- b. In the event of a conflict between the above listed references and these Specifications, the one having the more stringent requirement shall govern.

1.04 <u>SUBMITTALS</u>

- a. Prior to the start of any construction at the Project Site or ordering of any materials associated with the concrete construction, the Contractor is to submit, for review, the proposed construction methods. This is to include, but not necessarily be limited to: form section layout and construction, control of exposed concrete color variation, finishing techniques to be employed, and methods of curing.
- b. Formwork
 - 1. The Contractor shall submit shop drawings for fabrication and erection of formwork for specific finished concrete surfaces. Shop drawings shall show the general construction of forms including jointing, special formed joints or reveals, location and pattern of form tie placement, and other items which affect the exposed concrete visually.
 - 2. Shop drawing review shall be for the general architectural applications and features only. The design of formwork for structural stability and sufficiency shall be the Contractor's responsibility. The submission of shop drawings shall be in accordance with another Section of the Specifications.
- c. Reinforcement
 - 1. The Contractor is to allow proper time for the review of shop drawings. The Contractor is to allow sufficient time for inspection of reinforcing steel, once placed, before ordering and placing of concrete. Whenever possible, the Engineer will attempt to reduce the amount of time

required for the completion of these functions. No work shall be started until the shop drawings have been reviewed by the Engineer.

- 2. The Contractor is to submit rebar shop drawings showing all plans, sections, details, elevations, bar schedules and diagrams of all bars, arrangements and assemblies as required for the fabrication and placement in the concrete formwork. Details are to be included for all special reinforcements at openings, and for all support accessories, which must be adequate in strength to hold applied live and dead loads without excessive or permanent displacement of the reinforcement. Shop drawings shall include the additional reinforcement around openings, at corners, and at other locations indicated and bars to have special coatings and/or to be of special steel or special yield strength shall be identified.
- d. Cast-In-Place Concrete
 - 1. Prior to the ordering of any concrete, the Contractor shall submit to the Engineer, for review, a design mix indicating the proposed proportioning of materials to be used for each class of concrete, together with documentation from an approved Testing Laboratory that the proportions proposed meet the specified requirements.
 - 2. The design mix or mixes shall be prepared by the Producer or Contractor's Testing Laboratory, and shall be prepared in accordance with ACI 318, "Proportioning on the Basis of Field Experience and/or Trial Mixtures". Each required design mix shall reflect the effects of the addition of all proposed or required admixtures. For the purpose of establishing a design mix containing a set-retarding admixture, the temperature may be assumed at 65°F.
 - 3. The design mix submittal shall include, but is not necessarily limited to the following:
 - a. Names of all Suppliers and/or Manufacturers.
 - b. Distance, in miles, from the Concrete Plant to the Job Site.
 - c. Certification of compliance of materials with ASTM Specifications as here in before specified.
 - d. Proposed proportioning of materials required for each design mix submitted for the various required concrete strengths, w/c ratios, and aggregate sizes.
 - e. Admixtures required and/or proposed and dosage of each for all temperature ranges proposed.
 - f. Sieve analyses for each aggregate size.
 - g. Required cylinder test results and curves.
 - h. Signed statement that the proposed proportions meet all of the Specification requirements, including required average compressive strength shall consist of a field strength test record, several strength test records, or trial mixtures. All documentation submitted shall conform to the requirements of ACI 318.
 - 4. All design mixes, for each proposed mix and strength of concrete and maximum coarse aggregate size, shall be submitted to the Engineer at least 15 days prior to the start of the work. The Contractor shall not begin concrete production until the mixes have been reviewed and accepted by the Engineer.
 - 5. The Contractor is to submit certified reports of tests indicating that the aggregates comply with the Specifications.
 - 6. All concrete to be placed by pumping shall be proportioned in accordance with ACI 304R, to meet the minimum strength, slump, and air content requirements as specified herein, except that the volume of coarse aggregate per unit volume of concrete may be reduced by 10%. The

use of high range water reducing (HRWR) admixtures in pumped concrete is as specified in another Section of these Specifications.

- 7. The cost of preparing the design mixes shall be included in the cost to construct the various related items.
- 8. Location of all anticipated construction joints.
- 9. A finishing schedule indicating the type or types of finishing operations that the various components of the Structure shall receive based on the Contractor's understanding of the Contract Documents.

PART 2 PRODUCTS

2.01 FORMWORK

- a. Formwork is to be made from metal forms, "Exterior" grade waterproof plywood panels, or plasticcoated plywood. All exposed concrete, regardless of specified finish, is to be constructed using plastic-coated plywood panels. Where the use of form lumber is permitted by the Engineer, it is to be dressed on four (4) sides and only selected boards are to be used for form surfaces in contact with concrete. Forms shall appear new and be free of defects that will mar the finished concrete surface.
- b. Form Fasteners
 - 1. Only approved form ties and form hangers are to be used. They are to be provided with a waterstop washer not less than ³/₄" in diameter and be of such a type, that after forms are stripped, the ties can be broken back a minimum of 1¹/₂" from the surface of the concrete or, after bolts are removed, the portion of the tie remaining in the concrete would be no closer than 1¹/₂" to the face of the concrete. Ties are to be fitted with lugs, cones, washers, or other devices within the form which will leave a hole not larger than ⁷/₈ "in diameter or deeper than ³/₄". That portion of the tie which is removed from the concrete is to be coated to assure a break back of 1¹/₂" with a material which will not impair the concrete strength or prevent bonding between the concrete and the hole mortar patch. The spacing of form ties and form hangers is to conform to the Manufacturer's recommendations and the previously specified criterion for a uniform geometric pattern of form ties.
- c. Form Release Agents
 - 1. The form release agent shall be "Grifcote LV-50-Plus" as manufactured by Hill and Griffith Company or equal.

2.02 <u>REINFORCEMENT</u>

- a. Reinforcing Steel and Accessories
 - 1. Reinforcing bars are to be deformed, intermediate grade, 60,000 psi minimum yield strength, new billet steel, manufactured in the United States and conforming to the requirements of ASTM A615, Grade 60.
 - 2. Reinforcing tie wires are to be No. 16 U.S. steel wire gage, black soft annealed wire, conforming to Federal Specifications FS-QQ-W-461G.

3. Welded wire reinforcement shall be deformed, delivered in flat sheets, and is to conform to the requirements of ASTM A1064. All welded wire reinforcement is to have 70,000 psi minimum yield strength. Testing as indicated in ASTM A1064 is to be undertaken and the results are to be given to the Engineer for his review.

2.03 EMBEDDED AND INSERT ITEMS

- a. Anchorages for mechanical and/or process equipment requiring a high degree of accuracy in their locations are to be made by using heavy duty concrete anchors as manufactured by Deco-Decatur Engineering Company; Unisorb Jakebolts Corporation; or equal. Anchor bolts are to be as indicated and/or detailed on the Drawings.
- b. Expansion anchors are to Type 316 stainless steel wedge type, such as "Kwik Bolt 3-316 Stainless Steel" as manufactured by Hilti, or equal.
- c. Anchor bolts cast in concrete for attachment of aluminum and stainless steel work are to be Type 316 stainless steel hooked bolts, with stainless steel nuts and washers. Anchor bolts, for attachment of structural steel work, shall conform to ASTM F1554 Grade 36, unless otherwise indicated on the Drawings.
- d. Anchor bolts for attachment of structural steel and equipment bases are to be as shown on the Drawings.
- e. Epoxy anchors shall be stainless steel type 316 threaded rod stud. Epoxy shall be a two component, low deflection ceramic filled epoxy. The epoxy material shall be "HIT-RE-500 V3" as manufactured by Hilti, or equal. The adhesive shall contain no solvents or styrene. Anchors to be installed in pneumatic drilled holes. Diamond cored holes shall not be permitted.

2.04 <u>CAST-IN-PLACE CONCRETE</u>

- a. Cement
 - 1. All cement shall be Type II or Type I/II, Portland cement, of domestic manufacture, and conforming to ASTM C150. All cement is to be delivered in approved containers and stored as directed and specified. Bagged cement is to be plainly marked with name of Manufacturer, the date of manufacture, the type of cement, and the net weight. All cementitious products are to be the product of one Manufacturer.
 - 2. Bulk deliveries are to be provided with delivery tickets containing data as to name of Manufacturer, date of manufacture, type of cement, and weight.
- b. Aggregate
 - 1. All normal weight aggregates, coarse and fine, shall conform to the requirements of ASTM C33. All aggregates are to be free from any substance that may be deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete. Tests are to conform to ASTM C227. Aggregate shall be from one source.
 - 2. Fine aggregates are to consist of washed sand, leaving sharp, hard, uncoated siliceous grains. The fineness modulus must not vary by more than 0.20 throughout the work. Fine aggregates from different sources of supply are not to be mixed or stored in the same stockpile, nor used alternately in the same concrete mix or the same structure.

- 3. Maximum size of coarse aggregate shall be 3/8 inch for placements with a maximum thickness of 4 inches. For all other placements use No. 57 (1" to No. 4) maximum with the exception of columns and piers less than 12 inches. The smallest dimension of the entire concrete placement (slab, beam, wall) shall govern the coarse aggregate size.
- c. Water
 - 1. Water for mixing concrete and mortar shall be taken from an approved source and be clear and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substance.
- d. Admixtures
 - 1. All admixtures shall be compatible. Admixtures, which are not submitted with the accepted concrete mix design, shall not be used.
 - 2. Air-entrainment shall be provided through the addition of an air-entraining admixture conforming to ASTM C260. The admixture is to be "MB-AE90" as manufactured by BASF The Chemical Company, or equal. The admixture is to be used in strict accordance with the Manufacturer's recommendations and in such quantity to produce the required air content. All normal weight concrete exposed to the weather or liquid shall contain 6% (±1%) entrained air.
 - 3. Concrete may contain a water-reducing set controlling admixture conforming to ASTM C494. Acceptable admixtures shall be Daraset 200 / Daratard 17 / WRDA + Hycol - Grace Corp., Pozzutec 20+ / Pozzolith 200N / Pozzolith 100XR - BASF The Chemical Company, or Plastocrete 161LF / Plastiment - Sika Corporation, or equal. The admixtures are to be used in strict accordance with the Manufacturer's written recommendations.
 - 4. Pumped concrete shall contain a high range-water reducing (HRWR) admixture conforming to the requirements of ASTM C494, Type F. The admixture shall be "Rheobuild 1000" as manufactured by BASF The Chemical Company, "Sikament 686" as manufactured by Sika Corporation, or equal. The admixture shall not contain added chlorides, thiocyanates, (naphthalene or melamine) formaldehydes, or lignins. The admixture shall be used in strict accordance with the Manufacturer's written instructions. Concrete containing an HRWR admixture may include a water-reducing set controlling admixture by the same Manufacturer, elsewise the inclusion of water-reducing set controlling admixture must be based on the Manufacturer's approval. The maximum slump for concrete containing an HRWR admixture shall be 8" unless otherwise directed by the Engineer. Water shall not be added after the introduction of a HRWR into the concrete mix. The Contractor shall have on site additional HRWR, from the same Manufacturer as used at the Plant, for re-dosage no more than twice.
 - 5. In no case shall the use of calcium chloride in concrete be permitted. Accelerating admixtures are not to be used in any concrete work without the Engineer's review. Frozen materials containing ice or snow are not to be used.

e. Concrete

- 1. All concrete placed on the project shall be ready-mixed concrete.
- 2. All reinforced concrete shall have a specified 28-day compressive strength of 4,500 pounds per square inch, unless otherwise noted on the Drawings. This concrete shall have a minimum cement content of 640 pounds per cubic yard, an air-entraining agent, and may contain an approved set-controlling admixture. Whenever this concrete is placed in any structure or part thereof used to hold, transport or process any portion of the treatment process, the maximum water content shall not exceed 32.3 gallons per cubic yard (W/Cm=0.42).

- 3. All non-reinforced concrete shall have a specified 28-day compressive strength of 2500 pounds per square inch, unless otherwise noted on the Drawings. This concrete shall have a minimum cement content of 490 pounds per cubic yard, a maximum water content of 38.3 gallons per cubic yard (W/Cm=0.65) and an air-entraining admixture as required.
- 4. All concrete, regardless of specified compressive strength, shall have a slump in the range of 3" to 4" prior to HRWR.
- f. Bonding Agent
 - 1. The epoxy bonding agent shall be "Armatec 110 EpoCem" as manufactured by Sika Corporation, or equal.
- g. Curing Materials
 - 1. The liquid membrane-forming curing compound shall conform to the requirements of ASTM C309 Type I, Class B. The curing compound shall contain a fugitive dye. Curing compounds shall conform with all applicable VOC regulations.
- h. Protection Materials
 - 1. Impervious paper, waterproofing curing paper, and polyethylene film used during curing operations shall conform to ASTM C171. Waterproofing curing paper shall be "Reinforced Poly Wrap," as manufactured by Holland Manufacturing Company, Inc., or equal.
- i. Construction Joints and Expansion Joints
 - 1. Foam filler material shall be Progress Unlimited, Inc., "Resilient White Closed Cell Cross-Linked Polyethylene/Vinyl Foam Joint Filler," Code No. FF-7 with 90% recovery factor and with a density of 2.2 pounds per cubic feet, or equal. Fiber filler material shall be "Fibre Expansion Joint" by W.R. Meadows, or equal.
 - 2. Where a joint sealing compound is required, the sealant shall be a two-component Polysulfide Sealant "Synthacalk GC2+," as manufactured by Pecora Corporation, or equal.
- j. Grout
 - 1. Pre-mixed non-metallic non-shrink grout for bedding plates and column bases and as otherwise called for on the Drawings shall be as manufactured by the following or equal:
 - a. Sika Corporation "SikaGrout 212"
 - b. Five Star "Five Star Grout"

PART 3 EXECUTION

3.01 <u>TESTING</u>

- a. Reinforcement Testing
 - 1. Where reinforcing material is properly identified, mill reports will be accepted. The Contractor shall submit one copy of the Steel Producer's certificates of the mill tests.
 - 2. When the Manufacturer's name or the heat identification number of the Manufacturer's chemical analysis is unknown, a Testing Laboratory is to undertake a testing program. At least one tensile and one bending test is to be made on each five tons, or fraction thereof, for each size of reinforcement in each lot. The Testing Laboratory used by the Contractor is to be

acceptable to the Engineer. The Contractor is to pay for all such tests and submit at least one copy of each test made to the Engineer.

- 3. Reinforcing steel that fails to meet the requirements of the testing program is to be rejected and removed from the Project Site. The Contractor is to submit new steel for testing and continue to do so until the steel passes the tests. No steel is to be used for reinforcing until satisfactory test reports are received by the Engineer.
- 4. In the event that the Engineer requires additional testing of reinforcing materials that have been delivered to the Project Site, the Contractor is to make such materials available in the sizes, lengths, and quantities necessary for testing, at no additional cost.
- b. Cast-In-Place Testing
 - 1. The Owner will designate a Testing Laboratory, which is to perform all testing and provide inspection services when required. The Testing Laboratory is to meet the requirements of ASTM E329 and is to be a laboratory different from that which provided the concrete design mix proportions.
 - 2. All Concrete test cylinders are to be cast by the Testing Laboratory. All necessary assistance is to be afforded these persons by the Contractor in order to execute this work, at no additional expense to the Owner.
 - 3. The test cylinders are to be made in accordance with the requirements of ASTM C31. Test cylinders for strength of pumped concrete are to be taken at the point of delivery from the pumping line or at the point of discharge.
 - 4. A minimum of five test cylinders are to be made for each 20 cubic yards or portion thereof, of concrete deposited, two of which will be tested at age seven days, two to be tested at age twenty-eight days, and the fifth cylinder will be tested, if needed, to confirm strength at an earlier or later day than twenty-eight days. The tests are to be performed by the Testing Laboratory in accordance with the requirements of ASTM C39. Test cylinders are to be made at intervals spaced to provide a representative sampling of the entire placement. A minimum of one set of cylinders will be taken for each day concrete is placed regardless of quantity.
 - 5. Concrete test cylinders are to be properly marked, showing the name of the Project, the location of the concrete tested, the design strength, and the identification numbers of the cylinders in numerical sequence.
 - 6. The Contractor shall provide a curing box, on the Project Site, for the safe storage and proper curing of test cylinders in accordance with ASTM C31. The curing box shall be of sufficient size to accommodate the maximum number of test cylinders cast for any daily placement. The curing box shall be insulated, with an insulated hinged cover, and shall store cylinders on Site until transported to the Testing Laboratory. The temperature within the curing box shall be maintained between 60°-80°F, as specified in ASTM 31. Heating devices and/or blankets shall be supplied by the Contractor to maintain the temperature limits. If space heaters are used, care shall be taken so that the cylinders are not overheated. In the case where the cylinders are stored indoors, the cylinders shall be covered with plastic bags, in order to retain the moisture in the cylinders. The curing box shall be recorded daily. The location of the curing box shall be in an area that is free from disturbance and vibration, such as pile driving

and traffic. Failure to maintain these conditions may result in additional testing at the cost of the Contractor. No concrete shall be delivered to the Site until the curing box, as described, has been provided. The cylinders shall remain in the curing box a minimum of 24 hours or until transported to the approved Testing Laboratory.

- 7. The cylinders shall be transported in such a manner that they will not be jarred, rolled, bounced, or dropped.
- 8. If any test cylinders fail to attain the required strength, concrete work is to be terminated until the Engineer and the Contractor meet to determine the cause, and steps are taken to assure that all future concrete work will attain the desired strength. In order to determine what steps are to be taken to achieve the specified requirements, the Engineer will direct additional testing of the unsatisfactory concrete, at the Contractor's expense.
- 9. Slump tests are to be performed by the Testing Laboratory, or an authorized representative of the Engineer, in accordance with the requirements of ASTM C143. Excessive slump will be a cause for rejection of the truckload of concrete.
- 10. The Testing Laboratory, or an authorized representative of the Engineer, reserves the right to perform air content tests on concrete delivered to the Project Site. This test will be performed in accordance with ASTM C173 or ASTM C231. The results of the air content test shall be noted on the delivery ticket.
- 11. If required by the Engineer, an inspector from the Testing Laboratory will be directed to inspect the concrete at the batching plant. The cost of such inspection will be paid by the Contractor.
- 12. All test reports are to be submitted to the Engineer on appropriate forms.
- 13. All test reports are to include the Project name, name of Contractor, name of concrete testing service, name of concrete supplier, placement location and date, date of test, cylinder numbers, and tests results. Test reports are also to indicate whether or not materials are acceptable for their intended use.

3.02 FORMWORK

- a. Forms are to conform to required shapes, lines, surface scorings, and dimensions of the members, as shown on the Drawings. All joints are to be horizontal or vertical, and uniformly spaced. All panel faces are to be as large as possible to reduce the number of form joints.
- b. Shoring is to be designed to support the weight of concrete and the loads incurred during placing, with due regard to the height of shores. Shoring is to be laterally braced at all splice points. Forms and shores are to be braced or tied so that there is no displacement of formwork during casting and hardening of concrete.
- c. The Contractor is to provide cross bracing for shoring to resist lateral wind forces, and especially against braking, turning and acceleration forces due to any mechanical equipment used in placing the concrete. The Contractor is to be fully responsible for the design of forms and their shores.
- d. Where shoring is supported on the ground, temporary footings of timber, steel or concrete are to be provided which will support the wet concrete without settlement. These footings are to be founded

on firm soil, sufficiently below the ground surface so that they will not settle when the ground is wet, or when frozen ground is thawing.

- e. Finished concrete surfaces are not to vary from the theoretical horizontal or vertical planes as specified elsewhere in these Specifications. Where it is necessary to maintain the specified tolerances, the formwork is to be cambered so as to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.
- f. Positive adjustment of shores and struts is to be provided by means of wedges or jacks, and all settlement is to be taken up during the concrete placing operation. Adjusting devices are to be securely braced against lateral deflections.
- g. Earthcuts shall not be used as forms for vertical surfaces, unless otherwise specified and shown on the Drawings as an acceptable alternate detail.
- h. The Contractor is to construct and erect formwork for all exposed interior or exterior concrete surfaces in such a manner that, upon completion, a uniform and truly symmetrical pattern of horizontal and vertical joints will be evident. All form ties are to be uniformly spaced in both horizontal and vertical directions. The Contractor is specifically alerted to the intention of this Section of the Specifications with regard to appearance. It is the intention of this Section of the Specifications to do the minimum amount of concrete finishing work and rely upon form liners, where used, and the uniform geometric pattern of the forms and form ties to create the desired esthetic effect.
- i. The Contractor is to meet with the Engineer prior to constructing forms to plan the form arrangement or form pattern.
- j. Accessories
 - 1. All insert items are required to be placed in formwork, for the accommodation of other formwork. The Contractor shall place and/or build into the formwork all of these insert items, as required.
- k. Pre-Placement Inspection
 - 1. Before placing concrete, the Contractor shall complete and inspect the formwork installation, including forms, form ties, form oil, attached items, etc., reinforcing steel, and items to be embedded or cast in. He shall notify other crafts involved in ample time to permit the installation of their work and cooperate with other trades in setting such work, as required.
 - 2. The Contractor shall thoroughly wet all wood forms immediately before placing concrete, as required.
 - 3. The Contractor shall coordinate the installation of all joint materials and moisture barriers with the placement of forms and reinforcement.
- 1. Form Removal
 - 1. All forms are to be removed, cleaned, repaired and stored for subsequent use. If an inspection by the Engineer indicates that the form materials are not satisfactory for reuse, they are to be removed from the Project Site.
 - 2. No forms are to be removed until the concrete work has gained sufficient strength to support its own weight and normal construction loadings without permanent damage. The Contractor

is to provide and place all temporary posts, shores, braces or other devices which might be required for the temporary support of the concrete work. No temporary bracing is to be removed until the concrete work achieves its design strength.

- 3. The Contractor is to assume full responsibility for the premature removal of concrete forms. Any concrete which is damaged or does not achieve its design strength as a result of early form removal is to be removed and replaced at no cost to the Owner.
- 4. Forms may be removed early upon receipt of satisfactory evidence that the concrete supported thereon has attained sufficient strength to maintain the stability and safety of the structure. Laboratory test reports of job-cured test specimens shall be considered satisfactory evidence. All test specimens taken for the purpose of establishing justification for early form removal shall be made and tested at the expense of the Contractor.
- 5. Any spalls or cracks, which occur due to premature form removal, are to be repaired by the Contractor, to the satisfaction of the Engineer.
- 6. Form ties are to be broken back immediately after removing the forms. All holes left by such ties are to be filled immediately with mortar consisting of one part Portland cement and two parts sand, of the same type, manufacture and quality as used in the concrete.
- 7. If taper ties or she-bolts are used, the Contractor must submit, for the Engineer's review, method of filling the entire tie hole after removal of forms.
- 8. Care is to be taken in removing forms, walers, shorings, supports, and form ties to avoid spalling or marring of the concrete work.
- m. Re-Use of Forms
 - 1. Lumber, once used in forms, shall have nails withdrawn, and surfaces to be in contact with concrete shall be thoroughly cleaned before being used again. Plastic coated plywood forms, either patented or Job Site fabricated, shall not be used more than 10 times. Other plywood forms of "Exterior" grade surface shall not be used more than 3 times. The reuse of forms shall be permitted only if the forms, in the opinion of the Engineer, are suitable for the intended purpose. Split, frayed, delaminated or otherwise damaged form facing materials shall not be acceptable. "Patched" forms for exposed concrete surfaces shall not be used unless such forms are inspected by the Engineer. The Contractor shall apply new form coating compound materials to form surfaces as specified for new formwork. When forms are extended for successive concrete placement, the Contractor shall thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. He shall align and secure joints to avoid offsets.

3.03 <u>REINFORCMENT</u>

- a. Fabrication
 - 1. All reinforcement is to be fabricated to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice." In case of fabricating errors, the Contractor shall not re-bend or straighten reinforcement in a manner that will injure or weaken the material. All reinforcing steel is to be pre-cut and pre-bent off site in an approved fabricating shop by an acceptable subcontractor for reinforcing steel fabrication.
 - 2. All reinforcing is to be correctly rolled to the proper section and shall be free from all defects. Reinforcing shall have raised symbols to identify the Manufacturer, bar size and grade of steel.

- 3. Reinforcement with any of the following defects is not to be permitted in the work:
 - a. Bar lengths, depths, and bends exceeding specified fabrication tolerances.
 - b. Bends or kinks not indicated on Drawings or final shop drawings.
 - c. Bars with reduced cross-section due to excessive rusting, surface defects, or other causes.
- 4. All bends or hooks, unless otherwise required, are to be cold formed around pins. All hooks are to conform to the typical details on the Drawings.
- b. Delivery, Handling and Storage
 - 1. All concrete reinforcement is to be delivered to the Project Site bundled, tagged, and marked. Metal tags are to be used to indicate bar size, lengths, and other information corresponding to markings shown on the placement diagrams.
 - 2. All concrete reinforcing materials are to be stored at the Project Site, to prevent damage and accumulation of dirt or excessive rust.
- c. Installation
 - 1. The Contractor is to comply with the previously specified Codes and Standards and Concrete Reinforcing Steel Institute recommended practice described in "Placing Reinforcing Bars," latest edition, for details and methods of reinforcement placement and supports, and as herein specified.
 - 2. All reinforcement shall be cleaned prior to installation to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy the bond with the concrete.
 - 3. Bar supports shall be provided for reinforcement in foundation elements, slabs on ground, and all framed beams and slabs. Reinforcement shall be positioned, supported, and secured against displacement by formwork, construction, or concrete placement operations. Reinforcement shall be located and supported by metal chairs, runners, bolsters, spacers, and hangers.
 - 4. Reinforcing steel shall be supported in a manner that will maintain the clear distances between bars and the face of concrete as indicated on the Drawings or mentioned in the Specifications. Supports are to include slab and beam bolsters, low and high chairs, spacers and other devices suitable for the proper spacing, supporting and fastening of reinforcing bars or welded wire reinforcement in place. Consideration is to be given for all loads applied to the reinforcing. Supports for slabs on grade are to include sand plates, laterally welded braces for high chair legs and specially designed steel framed supports for heavy reinforcing.
 - 5. Reinforcing steel interfering with the location of other reinforcing steel, conduits or embedded items may be moved within the specified tolerances or one bar diameter, whichever is greater. Obtain the approval of the Engineer if greater displacement of bars to avoid interference is needed. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the Engineer.
 - 6. In no case will the use of masonry, stone, or wood be permitted for bar supports. Plastic protected or non-staining legs are to be provided in the case of bar supports being in contact with the formwork of concrete surfaces exposed to view after completion.
 - 7. Minimum wire sizes and spacing for support accessories are to be as follows:
 - a. Continuous high chairs or individual high chairs are to have legs of not less than #4 wire.

- b. Continuous high chair legs are to be spaced not more than 8" on center. Continuous longitudinal wires are to be not less than #1 wire. The connection of the legs to the continuous wire is to be strong enough to prevent bending of the legs out of the vertical plane or the breaking off of the legs from the continuous longitudinal wire.
- c. The Contractor is to vary the support bar diameters and spacing to suit each specific support requirement and detail them to suit the condition of loading.
- 8. The Contractor shall not place reinforcing bars more than two (2") inches beyond the last leg of any continuous bar support. The Contractor shall not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- 9. All reinforcement shall be secured against displacement by tying with No. 16 gauge, black soft annealed wire at all intersections, and shall be so supported so as to keep all reinforcement away from the exposed surfaces. Whenever the members are reinforced with two curtains of reinforcement, bar spacers securely tied to both curtains shall be provided.
- 10. The Contractor shall set all wire ties so that twisted ends are directed away from exposed concrete surfaces.
- 11. Tack welding of reinforcement shall not be permitted.
- 12. Reinforcement shall be contact lap spliced where practical, with the location of and minimum lap lengths as called for on the Drawings. Where no lap length is noted on plan or section, the minimum lap shall be as per the typical details for tension lap splices. All adjacent splices shall be progressively staggered at 5'-0" on center.
- 13. Provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by the opening for opening equal to 12" and up to and including 36", unless indicated otherwise. For openings less than 12", bend reinforcement around opening. For openings, larger than 36", see Contract Documents for specific reinforcement requirements. Extend each end of each bar beyond the edge of the opening or penetration by the tension development length for that bar size.
- 14. The Contractor shall install welded wire reinforcement in as long lengths as practicable. The Contractor shall lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire. The Contractor shall offset end laps in adjacent widths to prevent continuous laps. Rolled fabric is not permitted. All fabric shall be delivered in flat sheets.
- 15. Where welding is shown on the Drawings or specified, the Contractor shall comply with the requirements of AWS D1.4 for field welding. Prior to field welding, the Contractor shall determine the weldability of reinforcing bars by a laboratory analysis of steel. Only steel conforming to the chemical requirements specified in AWS D1.4 shall be used.
- 16. After the reinforcement has been placed, the Contractor shall notify the Engineer as to his readiness to have the reinforcing inspected. Concrete shall not be placed until the reinforcement placement is complete and has been inspected by the Engineer.

3.04 OTHER EMBEDDED AND INSERT ITEMS

a. Anchor bolts are to be set in pipe sleeves, where directed by the Engineer. All anchor bolts are to be set in templates and adequately braced to prevent misalignment during the placement of concrete. All bolts are to be of such a length that at least two (2) threads are exposed after tightening.

3.05 <u>CAST-IN-PLACE CONCRETE</u>

- a. Permissible Tolerances and Variations
 - 1. All concrete shall be in accordance with the tolerances or allowable variations specified in ACI 117.
 - 2. Tolerances apply to concrete dimensions only and not to the positioning of reinforcing steel, dowels, or embedded items.
 - 3. The Contractor is to establish and maintain sufficient control points and benchmarks in an undisturbed condition until final completion and acceptance of the Project. Control points and benchmarks are to be used for reference purposes to check tolerances.
 - 4. Regardless of the tolerances listed above, no portion of any Structure is to extend beyond the legal boundary of the Project.
- b. Measuring, Mixing and Transportation
 - 1. All concrete shall conform to the requirements of ASTM C94 and ACI 304R, except as otherwise specified.
 - 2. All ready-mixed concrete shall be secured from an approved Supplier having adequate equipment for proportioning, mixing, rigidly controlling, and delivering concrete in the quantities required for the work. The Engineer, or his agents, are to have the right to inspect the Plant and processes of the Supplier at all times. Thirty days in advance of the contemplated use of ready-mixed concrete, the Contractor is to submit the name and qualifications of the Supplier from whom he proposes to secure ready-mixed concrete to the Engineer for review.
 - 3. All dry materials, fine and coarse aggregate and cement, shall be measured by weight.
 - 4. The Contractor is to provide suitable automatic weighing equipment so that the fine and coarse aggregates for each batch will be weighted separately.
 - 5. Water shall be weighed in a separate batcher or measured by volume in a calibrated tank or by water meter. Admixtures shall be measured by volume.
 - 6. Regardless of how the required materials or quantities are measured, they shall be within the following tolerances; cement, 1%; aggregates, 2%; water, 1%; and admixtures, 3%.
 - 7. Mixers shall be of the rotary batch type and so made and operated as to insure a thorough mix, homogeneous in composition and uniform in color, with all coarse aggregate completely covered with mortar. The volume of the mixed material per batch shall be governed by the size of the mixer and the composition of the concrete, but shall not exceed the Manufacturer's rated capacity of the mixer. Each mixer shall be equipped with a suitable charging hopper, water storage tank and a water measuring device that is capable of being locked and will permit

the discharge of water only while the mixer is being rotated. All water, except that used for cleaning purposes, is to be admitted to the mixer through the measuring device. Each mixer is to be so equipped as to lock the discharge lever automatically until the batch has been placed in the mixer. The mixer is to be thoroughly washed and cleaned before and after use and be maintained in effective operating conditions at all times. If the mixer is not used for a period of 30 minutes, it is to be thoroughly cleaned before use.

- 8. All materials for each batch of concrete, including the water, are to be mixed for at least 1½ minutes, while the drum revolves at the speed for which it was designed, preferably between 12 and 20 RPM. In any case, the aggregate has been completely covered with mortar. Any batch mixed less than 1½ minutes or not completely discharged within 60 minutes after the addition of water is to be discarded at the Contractor's expense. No materials for a batch of concrete are to be placed in the drum of the mixer until the entire previous batch has been discharged.
- 9. The maximum length of time from loading at the ready-mix Supplier's Plant to the discharge of concrete at the Project Site shall not exceed 75 minutes, except that under conditions contributing to quick stiffening of the concrete or when the temperature of the concrete is 85°F or above, this time limit shall be changed to 60 minutes. If retarders are used which have been reviewed by the Engineer, they may increase the time limit to a maximum of 75 minutes. Under very severe conditions, the Engineer may further reduce the time limits or require a reduction of the size of the batches. During these intervals, the concrete shall be agitated continuously.
- 10. Each delivery of concrete to the Project Site shall be accompanied by a certificate showing: weights of materials and brand names as applicable, amount of water, type and quantity of admixture, and date and time of loading.
- 11. When concrete arrives at the Project Site with slump below that suitable for placing, as indicated above, water may be added provided that neither the maximum permissible watercement ratio nor the maximum slump is exceeded. Also, no water is to be added if a HRWR has already been added. The water is to be incorporated by additional mixing equal to at least one-half of the total mixing time required. An addition of water above that permitted by the limitation on the water-cement ratio is to be accompanied by a quantity of cement sufficient to maintain the proper water-cement ratio. The addition may only be authorized by the Engineer or his representative, and the cost must be borne by the Contractor.
- 12. The use of non-agitating equipment for the transportation of concrete will not be permitted.
- c. Concrete Placement
 - 1. Concrete is not to be placed until such time as forms, embedded materials, and reinforcement are securely fastened in position along with all other preliminary work has been inspected. Concrete is not to be placed in forms with standing water. If chutes are used, they are to be metal or be metal lined with a slope not to exceed 1 vertical to 3 horizontal.
 - 2. Concrete is to be handled from the mixer to the forms in such a manner that no segregation of ingredients will take place. Concrete is to be deposited in layers approximately level and not more than 18" in depth.
 - 3. All concrete is to be placed in such a manner that it will not drop freely more than 8' and it is to be placed as nearly as practicable in its final position, to minimize segregation of the ingredients.

- 4. Concrete for use in slabs and foundation elements may be placed by buggy bucket, ready-mix truck, or pumping methods, provided that the method selected will not cause the specified slump to be exceeded. In general, concrete in the walls is to be placed by means metal drop chute with hoppers. Drop chutes are to be provided in several lengths so that the total length of the chute can be adjusted as the concreting operations progress. Under special conditions, such as heavily reinforced thin walls, concrete is to be deposited through temporary openings in the sides of wall forms with the drop chutes positioned outside of the forms. Temporary openings are to be provided and spaced approximately 8' vertically and 8' horizontally.
- 5. Concrete is to be compacted while being placed with the aid of internal mechanical vibrators. Vibrators are to be used in a vertical position only and are to be applied directly to the fresh concrete. The intensity and duration of vibration is to be sufficient to cause the concrete to flow, to compact thoroughly and to completely embed the reinforcement, pipe, conduit, or similar work. Vibration is to be supplemented by hand spading in the corners and angles of forms while the concrete is still plastic and workable. The vibrating equipment is to be of size and type as required. Vibration of forms or reinforcement will not be permitted unless specifically authorized. Under no condition is the vibration process to be continued for such a time period that the aggregate would be segregated from the mix and impair concrete strength. Vibrators are not to be used to convey concrete, work concrete along the forms or otherwise to be used a motive force in handling concrete. Vibrator use shall be in accordance with ACI 309R-05.

d. Cold and Hot Weather Concrete Operation

- 1. In general, concreting during cold and hot weather is to be in accordance with the applicable provisions of ACI 318, ACI 306R, and ACI 305R.
- 2. For air temperatures between 40°F and 70°F when it is not anticipated that temperature will drop below 40°F no special protection will be required other than the means of maintaining concrete temperatures of at least 50°F, for a period of five (5) days after placing.
- 3. Concrete placement is not to be permitted when, in the opinion of the Engineer, the sun, heat, wind, rain, sleet, snow or humidity would prevent proper placement and curing.
 - a. Cold Weather
 - i. Whenever the temperature is below 40°F, or when it is evident that the temperature will drop below that point, concrete is not to be placed unless the Contractor has submitted, in advance to the Engineer, a detailed plan for taking appropriate precautions during cold weather operations. The plan should address at least all of the concerns enumerated below.
 - ii. The Contractor is to provide equipment for heating concrete aggregates and water and for maintaining freshly placed concrete at a temperature of not less than 50°F nor more than 90°F for a period of five continuous days. Water is not to be heated over 180°F. Concrete work is to be protected by windbreaks, heating and/or insulated blanket covers when necessary. Protection is to be left in place and intact for at least 24 hours after artificial heat is discontinued. The Contractor is to avoid rapid dry-out of concrete due to overheating and is to avoid thermal shock due to sudden cooling or heating. Forms shall be enclosed with automatic heaters, provided within the enclosures when needed to maintain the required temperature. Automatic

heaters, if used, shall be properly vented to the atmosphere. Coverings are to be left in place for the specified curing period.

- iii. When it is necessary to remove the protection temporarily during the process of the work, it is to be done in a manner that causes the least disturbance and allows the protection to be restored as quickly as practicable.
- iv. The Contractor is not to place the concrete on frozen subgrade or on sub-grade containing frozen materials. He is to ascertain that forms, reinforcing steel and adjacent concrete surfaces are entirely free of frost, snow and ice before placing concrete.
- v. All methods proposed for heating, and protecting the concrete are subject to review by the Engineer. Concrete is never to be heated over 90°F nor is any other overheating that would produce a flash set to be permitted.
- b. Hot Weather
 - i. Whenever the ambient temperature is above 90°F or when it is evident that the temperature will rise above that point, concrete is not to be placed unless the Contractor has submitted, in advance to the Engineer, a detailed plan for taking appropriate precautions during hot weather operations. The plan should address at least all of the concerns enumerated below.
 - ii. In general, concrete shall be delivered to the form at the coolest practicable temperature. The Contractor is to cool ingredients before mixing to maintain concrete temperature at time of placement below 85°F. Mixing water may be chilled or chopped ice may be used to control the concrete temperature, provided the water equivalent of the ice is calculated in the total amount of the mixing water such that the water/cementitious ratio remains within requirements.
 - iii. The Contractor shall cover all reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature does not exceed the ambient air temperature immediately before embedment in the concrete.
 - iv. The Contractor shall wet forms thoroughly before placing concrete. However, no standing water shall remain within the forms at the time of placement.
 - v. The Contractor shall adjust the mix to retard the setting time of the concrete, as reviewed by the Engineer, and as noted herein. Sunshades and windbreakers are to be provided when needed, to maintain the required temperatures and minimize excessive drying. Sunshades and windbreakers are to be left in place for the specified curing time.
- e. Concrete Curing
 - 1. Freshly deposited concrete shall be protected from premature drying, excessively hot or cold temperatures, flowing water and mechanical injury. Protective measures shall conform to ACI 308R. The concrete is to be maintained with a minimum moisture loss, at a relatively constant temperature, for the period of time necessary for the hydration of the cement and proper hardening of the concrete. Take extreme caution to prevent moisture loss during the 3 to 10 hour period following placing, as the concrete is particularly vulnerable to shrinkage at this time.

- 2. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for maintaining the concrete in a moist condition for at least a 5-day period thereafter. Horizontal surfaces shall be kept covered and intermittent wetted to prevent localized drying.
- 3. The Contractor shall use one of the following methods to insure that the concrete remains in a moist condition for the minimum period stated above.
 - a. Ponding or continuous fogging or sprinkling.
 - b. Application of mats or fabric kept continuously wet.
 - c. Continuous application of steam (under 150°F)
 - d. Application of sheet materials for curing conforming to ASTM C171.
 - e. If approved by the Engineer, application of a curing compound.
- 4. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall not be used on surfaces to receive subsequent coatings such as any surface against which cementitious finishing materials are to be bonded, epoxy coatings or any surface for which the final finishing methods are incompatible with the use of a curing compound. Curing compound shall never be used for curing exposed walls with fluid or earth backfill on the opposite side.
- 5. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time period, and the subsequent appearance of the concrete surface shall not be affected.
- 6. The compound shall be applied in accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 300 square feet per gallon.
- 7. Curing compound shall be completely removed in accordance with manufacturer recommendations after curing has been completed.
- 8. The Contractor shall keep absorbent wood forms wet until they are removed. After form removal, the concrete shall be cured by one of the methods in paragraph C.
- f. Construction Joints and Expansion Joints
 - 1. The Contractor is to furnish, install or otherwise construct all joints as indicated or detailed on the Drawings. The use and location of joints is to be subject to the prior review by the Engineer. All joints are to conform to the details shown on the Drawings, and they shall be in accordance with the following criteria:
 - a. In walls the maximum length of a continuous concrete placement is to be 35'-0". In order to minimize shrinkage cracks, the walls are to be placed in one of the following manners:
 - i. The Contractor shall place alternate wall sections and place the closure sections after the first sections, on each side of the subsequent placements have been cured.
 - ii. The Contractor shall place the entire wall length in adjacent sections next to each other, provided that the preceding section has been cured.
 - 2. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than five feet from a corner.

- 3. In slabs on the ground, with reinforcement or welded wire fabric reinforcement, the Contractor shall, in order to minimize shrinkage cracks, place the slabs in one of the following manners:
 - a. The Contractor shall place the slab in alternate sections in a checkerboard pattern, with closure sections placed after alternate sections have cured. Each individual section shall be approximately square and shall not be more than 400 sq.ft. in area.
 - b. The Contractor shall place the slab in strips approximately 15 ft. in width and shall provide contraction joints by means of saw cutting, hand tooling or by inserting preformed plastic or metal strips into the slab after it has been placed. Maximum spacing shall not exceed the width of the concrete placement. Depth of joint shall be 1-1/2 inches in reinforced concrete and 1/3 the thickness of the slab in unreinforced concrete. Adjacent sections shall not be placed until the concrete has cured.
- 4. All reinforcing steel and welded wire fabric shall be continued across construction joints. Reinforcing steel shall be discontinuous across expansion joints.
- 5. The Contractor shall place mat foundation areas in as large a volume as practicable.
- 6. Joints not indicated on the Contract Drawings are to be so made and located as to least impair the strength of the Structure. Construction joints in walls and slabs are to conform to ACI 318.
- 7. The Contractor shall submit to the Engineer for review a plan showing the location of his proposed construction joints for each Structure prior to beginning construction of the various Structures.
- 8. Construction joints are to consist of keyed joints, except as shown, and are to be installed as specified previously. If the Contractor desires to install additional construction joints, at his own expense, he is to submit working drawings for approval showing the proposed locations and a placement schedule.
- 9. Whenever a stoppage of more than 30 minutes occurs in the placing of concrete, construction joints are to be installed.
- 10. All construction joints are to have a row of form ties located at a distance of approximately 6" from the joint, to permit aligning and tightening of the forms for subsequent sections.
- 11. Expansion joints shall be installed where shown on the Drawings in base slabs and supported slabs and shall be constructed as detailed on the Drawings.
- 12. Expansion joints shall be formed by means of a preformed foam or asphalt joint filler consistent with the type of joint as detailed on the Drawings. The joint fillers shall be installed in strict accordance with the joint details shown on the Drawings and the Manufacturer's recommendations.
- 13. Sealant material shall be installed in strict accordance with the Manufacturer's recommendations. A primer compatible with the sealant used shall be applied to all concrete surfaces. Sealants shall be cured the length of time required by the sealant manufacturer.
- g. Concrete Finishing
- 1. It is the specific intention of this Section of the Specifications to leave all surfaces in a first quality condition, regardless of the method of concrete finishing. Work that does not meet the quality standards implied, or directly specified, or which does not meet with respect to the esthetic quality desired will not be accepted and such work is to be refinished until finally acceptance by the Engineer.
- 2. Within 24 hours after the removal of forms, all honeycombing, pockets and open spaces are to be thoroughly wetted and scrubbed with a brush and then be compactly filled with mortar consisting of one (1) part of Portland cement and two (2) parts sand, of the same type and quality as used in the concrete. This operation is to be considered patching. This is to be done on all surfaces even though they will be covered with backfill afterward. All surfaces are to be neatly finished at the edges.
- 3. During finishing operations, the sprinkling with dry cement or the addition of water shall be strictly prohibited.
- 4. Rubbing and finishing, as defined hereinafter, shall begin not more than 48 hours after form removal, while the concrete is green and can have its surface worked without impairing structural quality or risking future delamination of the textured surface finish.
- 5. Before starting the concrete construction of any Structure, the Contractor shall submit to the Engineer, for review, a finishing schedule indicating the type or types of finishing operations that the various components of the Structure shall receive based on the Contractor's understanding of the Contract Documents. The Contractor shall not begin this work until he receives the Engineer's concurrence with the Contractor's schedule.
- 6. Concrete surface finishing shall consist of the following defined operations:
 - a. Patching Filling of holes, honeycombs, air bubbles of all sizes or other voids within 24 hours of form removal.
 - b. Rubbing The method employed to remove unwanted concrete projections or other surface imperfections that generally project outward from the normal plane of the concrete. Mechanical or hand rubbing tools of various types used in the construction industry shall be employed. Bagging shall not be considered as part of the rubbing operations.
 - c. Finishing The method employed to complete the final surface finish such as wood float, steel trowel, broom, cork board, burlap bag or other means. In some instances one or more of these treatments might be required to leave the concrete surface ready to receive special surface finishes such as tile, slate, paint or other coatings or materials. Interior concrete surfaces that remain exposed to view, even though painted, shall receive a swirl-applied, sandpaper textured finish developed by stoning, cork board working, and bagging without removing the textured finish. This finish shall be developed by working the green concrete, and shall not delaminate upon drying. Dust shall be removed prior to any painting.
 - d. Surfaces to receive a protective coating shall be finished in accordance with manufacturer recommendations. All concrete surface preparations with regards to bonding of the coating to the substrate shall be strictly adhered to.
- 7. During the screening and floating operations, care shall be taken that the surface is free from holes, depressions and high spots. The finished surface shall not fall more than 1/8" from a

10 ft. steel straightedge applied to the surface at any point and shall have no visible unevenness.

- 8. All exterior slabs including walkways, sidewalks, landings, pads at doorways or entrances, walk-on roof decks (including fill areas), or other similar, exterior access areas are to be wood floated and light broom finished.
- 9. Exterior slabs that receive no foot traffic are to be wood-floated.
- 10. Exterior exposed concrete ramps shall receive the same no-slip finish as hereinbefore specified for treads and platforms.
- 11. Finish requirements in process areas shall be such as to produce a dense surface by steel troweling, with smooth features that shall not impede the flow of water or allow the adhesion of solids.
- 12. Where any process area is to be grouted along the floor surfaces, the base surface is to be left rough to receive the grout. Grout used shall be as specified by the equipment Manufacturer, or as directed by the Engineer, shall be of the thickness shown on the Drawings or Manufacturer's approved shop drawings, and shall receive a steel trowel finish unless otherwise finished mechanically.
- 13. The Engineer will make all final decisions with regard to finishes whenever the work to be undertaken may fall into one or more of the categories described above.
- 14. In the event that efflorescence, stains, oil, grease, or any unsightly accumulation of foreign materials are visible on the exposed surfaces of finished concrete, the Engineer may require remedial action to remove these blemishes. Such action may cover all exposed concrete, or when irregular lapping can be avoided, only such parts that are affected by the stains or other unsightly appearances shall be cleaned. Cleaning shall proceed as follows:
- 15. Remove oil and grease with detergents and scrubbing and thoroughly wash with water.
- 16. Only when directed by the Engineer, "Sack-Rub" concrete surfaces as follows:
 - a. Mix one-part of Portland cement, adding amounts of white Portland cement necessary to obtain required color, one-part fine industrial sand, an approved bonding agent, and sufficient water to give consistency of heavy cream. After surfaces are prepared and wetted down, rub the mortar thoroughly over the entire surface with clean burlap. After short interval, remove dried grout with dry burlap without removing from pits.
 - b. Spots or streaks remaining may be honed dry and lightly so as not to change the texture of the concrete.
- h. Concrete Protection
 - 1. After curing compound application or required curing period, concrete slabs are to be covered with a waterproof curing paper. All seams of such paper are to be overlapped at least 4" and sealed with tape. Further protection is to be provided when erecting equipment, by means of planking of sufficient size, or such other protection, as is required. The paper is not to be removed prior to the final cleaning, and in any case, not sooner than 28 days after being placed.
- i. Cleaning Up

1. Cleanup shall be undertaken upon completion of the work in this Section. Upon final completion of all work included herein; all surplus and waste materials resulting from the concrete and cement finishing work, including all tools and implements employed therein, shall be removed from the Project Site. The Structures and all portions of the Project Site affected by work under this Section shall be left in a neat, clean and acceptable condition.

3.06 STORAGE OF MATERIALS

a. Storage facilities are subject to the inspection by the Engineer. Cement is to be stored well off the ground in a dry, weather tight, adequately ventilated structure with provision to prevent the absorption of moisture. Aggregates are to be stored in a manner to assure good drainage, to preclude the inclusion of foreign matter, and to preserve the gradation. Each size group is to be kept separate by means of bulkheads between the piles.

END OF SECTION

SECTION 03400 PRECAST CONCRETE

PART 1 GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. Requirements for furnishing and placement of precast concrete wet wells and valve chambers as indicated on the Drawings and all accessories necessary, including product design not shown on the drawings.
- b. It is the responsibility of the manufacturer to produce precast concrete units of the quality specified, and from the concrete mix formulae designed to suit the particular manufacturing and project requirements.

1.02 <u>REFERENCED SECTIONS</u>

a. Section 03005 – Structural Concrete

1.03 <u>CITED STANDARDS</u>

- a. American Concrete Institute (ACI) Manual of Concrete Practice301, Specifications for Structural Concrete for Buildings
 - 1. 318, Building Code Requirements for Reinforced Concrete
 - 2. 350, Code Requirements for Environmental Engineering Concrete Structures
- b. American Society for Testing and Materials (ASTM)
 - 1. A36, Specification for Carbon Structural Steel
 - 2. A82, Specification for Steel Wire for Concrete Reinforcement
 - 3. A153, Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
 - 4. A416, Specification for Steel Strand, Uncoated Seven Wire for Prestressed Concrete
 - 5. A615, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - 6. C31, Making and Curing Concrete Test Specimens in the Field
 - 7. C33, Specification for Concrete Aggregates
 - 8. C150, Specification for Portland Cement
 - 9. C93, Specification for Precast Concrete Water and Wastewater Structures
 - 10. C260, Air-Entraining Admixtures for Concrete
- c. American Welding Society (AWS) D1.1 Steel
- d. International Building Code, 2015
- e. Precast/Prestressed Concrete Institute (PCI)
 - 1. MNL-116, Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products

- 2. MNL-120, Design Handbook Precast and Prestressed Concrete
- 3. MNL-123, Manual on Design of Connections for Precast/Prestressed Concrete
- 4. MNL-124, Design for Fire Resistance of Precast/Prestressed Concrete

1.04 DESIGN REQUIREMENTS

- a. Load Calculations: Precast units shall be detailed and fabricated to withstand design loads as determined by the International Building Code, and as indicated on the Drawings. This includes calculations of all stresses and strains due to temperature changes, handling, transporting, and erecting of units. Structural properties of the units shall be calculated in accordance with ACI 350 including environmental durability factor.
- b. Dimensions and Tolerances: Precast units shall be fabricated to dimensional tolerances in accordance with PCI-MNL-120. Members shall be designed to accommodate construction tolerances, and clearances of intended openings.
- c. Design shall be performed by a qualified Professional Engineer registered in the Commonwealth of Massachusetts.

1.05 QUALITY CONTROL

a. All manufactured precast concrete units shall be produced by an experienced manufacturer regularly engaged in the production of such items. All manufactured precast concrete and site-cast units shall be free of defects, checks and cracks. Care shall be taken in the mixing of materials, casting, curing and shipping to avoid any of the above. The Engineer may elect to examine the units at the casting yard or upon arrival of the same at the site. The Engineer shall have the option of rejecting any or all of the precast work if it does not meet with the requirements specified herein or on the Drawings. All rejected work shall be replaced at no additional cost to the Owner.

1.06 **QUALIFICATIONS**

- a. Fabricator: Plant production and engineering must be under direct supervision and control of an Engineer who possesses a minimum of five years' experience in precast concrete work.
- b. Erector: Company specializing in erecting the work of this Section shall have three years of documented experience and have been approved by the fabricator.
- c. Welder: Qualified within previous 12 months in accordance with ANSI/AWS D1.1.

1.07 <u>SUBMITTALS</u>

- a. All shop drawings, samples, tests or other data are to be submitted by the Contractor for the review and approval by the Engineer prior to fabrication of the units.
- b. The design of the precast units and all related drawings shall be signed and sealed by a Professional Engineer currently licensed in the Commonwealth of Massachusetts. The signed and sealed design shall be submitted to the Engineer to ensure the units conform with the Contract Documents.
- c. Shop drawings shall indicate the layout, unit locations, unit identification marks, reinforcement, connection details, embedded items, lifting locations, support items, dimensions, openings and

relationship to adjacent materials. Deflections, cambers, bearing requirements, and special conditions shall also be submitted for review.

- d. Information on lifting and erection procedures including certified reports for all lifting inserts shall be submitted for review by the Engineer.
- e. Prior to the production of any precast units, the manufacturer, through the Contractor, is to submit to the Engineer the concrete mix design for the units for review. The Engineer must be notified in advance of any changes to be made to the approved design mixes during production.
- f. All exterior coatings.

1.08 DELIVERY, STORAGE, AND HANDLING

- a. Precast members shall not be transported away from the casting yard until the concrete has reached the minimum required 28-day compressive strength and a period of at least 7 days has elapsed since casting.
- b. Precast units are to be handled, transported and stored in a manner to avoid undue strains, cracking, staining or other damage. Precast units shall be lifted and supported only at the lifting or supporting points as indicated on the shop drawings.
- c. Damaged or defective units are to be repaired or replaced as directed by the Engineer. Units are to be delivered from the plant to the project site in accordance with the project schedule and proper setting sequence.
- d. Deliver anchorage items that are to be embedded in other construction before starting such work. Provide setting diagrams, templates, instructions and directions, as required, for installation.

PART 2 PRODUCTS

2.01 CONCRETE

- a. Each material used in the precast concrete units is to be from one source and to match consistently throughout. The workmanship, color and texture of the precast units are to match the approved samples.
- b. For precast concrete items, the minimum 28 day compressive strength of concrete shall be 5,000 psi when tested in accordance with ASTM C39.
- c. Precast concrete is to meet the following design criteria:
 - 1. Cement is to be Portland Cement Type II or Type I/II and conform to ASTM C150. The minimum cement content shall be 600lbs of cement per cubic yard of concrete.
 - 2. Fine aggregates are to be natural or manufactured sand, conforming to ASTM C33.
 - 3. Coarse aggregate is to be gravel or crushed stone conforming to ASTM C33.
 - 4. Mixing water is to be clean and free of any acid, alkali, oil or organic material that may interfere with the setting of cement.
 - 5. The maximum water-to-cement ratio shall be 0.40 by weight.

- 6. Air entraining admixtures are to conform to ASTM C260 and produce from $3-5\% \pm 1\%$ air content by volume when tested in accordance with ASTM C138.
- 7. The water-cement ratio is to be kept to a minimum and the concrete slump is not to exceed 3" when tested according to ASTM C143.
- 8. Water absorption is not to exceed 5% when tested in accordance with ASTM C97.
- 9. All concrete is to be mixed in a mixer that will distribute the coarse and fine aggregate evenly throughout the mix. Each batch is to be mixed in proportion by weight.
- 10. Concrete is to be handled, conveyed and placed in the forms by methods that will prevent segregation of the aggregates.
- 11. The concrete is to be consolidated in the form by a method of high frequency impact type vibration. Finished products must be free of any honeycombing or voids.
- 12. The use of admixtures to prevent weathering or increase workability is acceptable provided such admixtures do not cause any deleterious effects to the finished surfaces or the concrete strength.

2.02 <u>CONCRETE TESTING</u>

- a. The Contractor is to pay for all work associated with testing of materials and casting and testing of cylinders under this Section. All test specimens are to be taken from the actual mixes used in fabrication of the units and are to be tested in accordance with the latest applicable ASTM Standards in an approved testing laboratory. Reports of all tests are to be submitted to the Engineer for review and approval. The Owner is to select the Testing Laboratory.
- b. A set of five standard test cylinders is to be made for the first precast concrete unit of each type. Thereafter, a set is to be made for each 25 cubic yards of concrete or less placed in one day. From each set, two test cylinders to be tested at 7 days, two cylinders to be tested at 28 days and the other cylinder shall be held for 56 days and tested if the 28 day average does not meet the required strength. Slump tests are to be made for each batch of concrete.
- c. The sampling, storing and testing of concrete cylinders is to be in accordance with ASTM C172, ASTM C138, ASTM C31 and ASTM C39. Test cylinders below the required strength will be cause for rejection of the corresponding precast units.

2.03 <u>GROUT</u>

- a. Grout for joints between panels or segments shall be a non-shrink grout in conformance with CRD-C 621 and ASTM C 1107, Grade B or C when tested at a maximum fluid consistency of 30 seconds per CDC 611/ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes.
- b. Minimum compressive strength of grout at 28 days shall be 6,000 psi.
- c. Acceptable products shall be Euco N-S manufactured by Euclid Chemical Company; Masterflow 713 manufactured by Master Builders; Sikagrout 212 manufactured by Sika Corporation or equal.

2.04 <u>REINFORCING STEEL</u>

a. Reinforcing steel used for precast concrete construction shall conform to Section 03005 - Structural Concrete.

2.05 <u>ACCESSORIES</u>

- a. Neoprene or plastic bearing pads shall be provided where indicated or required by the member design.
- b. All bearing shims for precast units are to be high impact fire resistant plastic.
- c. Except where other materials are indicated or specified, all metal anchors, dowels, clamps, inserts, clip angles, anchor plates, bolts, edge channels and other fastening devices and accessories are to be hot dipped galvanized, cadmium plated or painted.

PART 3 EXECUTION

3.01 <u>GENERAL REQUIREMENTS</u>

- a. The first unit of each type cast is to be subject to the Engineer's inspection at the manufacturer's plant. Approved units are to serve as models for the remainder of the work and may be incorporated in the structure when no longer needed as models.
- b. All precast products are to have form marks removed using a carborundum stone. The exposed finish surface is to be bagged using burlap to present a smooth textured and uniform appearance. The portions of the precast units that are exposed to view are to match the color and texture of the approved models. In the completed work, no unfinished edges or surfaces are to be exposed to view. All surfaces to remain concealed may be finished in accordance with manufacturer's standard approved practice.
- c. Unless indicate otherwise on the Contract Documents, all precast below grade units shall be designed to withstand a lateral soil load of 90 psf plus surcharge and groundwater at grade. The calculation of lateral earth pressures and surcharges shall use $k_0 = 0.5$ for all load cases. Slabs less than 1'-0" above grade are to be designed for a minimum HL-93 live load, in accordance with the latest version of the AASHTO LRFD Bridge Design Specifications, in addition to all other dead loads. The design loading on the structure should consider the projection of the wheel load area at surface level based on the height of the earth cover. Slabs 1'-0" or more above finished grade shall be designed for a minimum live load of 300 psf. All units shall be designed to resist hydrostatic uplift pressures plus 20% assuming groundwater at grade. All calculations shall be signed and sealed by a Professional Engineer currently licensed in the Commonwealth of Massachusetts. The finished units are to be straight and true with all edges sharp, straight, and square, and all flat surfaces in a true plane.
- d. All precast concrete structures shall be designed and manufactured as per ASTM C913.

3.02 FABRICATION

a. All precast members shall be fabricated and cast to the shapes, dimensions and lengths shown on the Drawings and in compliance with PCI MNL-116. Precast members shall be straight, true and free from dimensional distortions, except for camber and tolerances. All integral appurtenances, reinforcing, openings, etc., shall be accurately located and secured in position with the form work system. Form materials shall be steel and the systems free from leakage during the casting operation.

- b. Reinforcing assemblies in all units are to be prefabricated and tied into single units of proper size and shape. All steel reinforcement is to be kept a minimum of ³/₄" from the edges and surfaces of precast units. Reinforcing supports are not to be used on exposed architectural concrete surfaces.
- c. All anchors, clips, inserts, lifting devices, bolts and devices required for handling and installing precast units and for the attachment of subsequent items are to be placed and secured in the forms as indicated or required. Sleeves or special items required for the proper function of the precast units are to be supplied and located prior to fabrication of the unit.
- d. Each precast concrete unit is to be properly marked on a concealed surface with a designation corresponding to the designation on the shop drawings.
- e. Failure of the precast concrete manufacturer to meet any of the above requirements is to be cause for rejection of the product by the Engineer.

3.03 INSTALLATION

- a. An experienced representative of the precast manufacturer is to supervise the entire installation of this work, when such supervision is deemed necessary by the Engineer.
- b. All precast work is to be accurately set in its assigned position, carefully plumbed and aligned and securely anchored to the structure in accordance with the approved details. Erection is to be by the manufacturer's personnel skilled in this type of work.
- c. Precast concrete units shall be set level, plumb, square and true within allowable tolerances in accordance with PCI-MNL-120 and MNL-116.
 - 1. The manufacturer is to furnish and install all loose shims, wedges, leveling plates, etc., for the support and bearing of precast units where needed.
 - 2. Grout shall be placed between adjacent precast members and along the edges of the assembled precast members. Care shall be taken to solidly pack such spaces and to prevent leakage or droppings of grout through the assembled precast members. Any grout which seeps through the precast members shall be removed before it hardens.
 - 3. In no case shall concentrated construction loads, or construction loads exceeding the design loads, be placed on the precast members. In no case shall loads be placed on the precast members prior to the welding operations associated with erection, and prior to placing of topping (if required).
 - 4. All precast units are to be delivered to the project site in the cleanest condition possible. During installation, the utmost care is to be directed to prevent staining or marring of the precast units. Upon completion of erection, the precast work is to be left clean. Final cleaning at a later date, if required, is to be the responsibility of the Contractor. Finished surfaces of precast concrete are to be protected at all times from defacement from welding or other operations by use of shields properly placed around these operations.
 - 5. No Contractor, Subcontractor or any of his employees shall arbitrarily cut, drill, punch or otherwise tamper with the precast members.

- 6. Precast units damaged while being erected will be rejected or shall be repaired in a manner approved by the Engineer.
- 7. Precast structures below grade shall be coated with coal tar epoxy applied in two coats, eight mils each. Acceptable product shall be Bitumastic 300M by Carboline or equal.

END OF SECTION

SECTION 05500 METAL FABRICATIONS

PART 1 GENERAL

1.01 <u>SCOPE OF WORK</u>

a. Metal fabrications include but are not limited to items such as ladders, cages, castings, fasteners and supports, stair and sill nosings, gratings and frames, floor hatches, grab pipes, guard posts, plates and frames, manhole steps, trash baskets and other such items which may require special fabrication to satisfy design intent.

1.02 **QUALITY ASSURANCE**

- a. All work performed and materials installed by the Contractor are to be in strict accordance with the latest requirements of the following governing Codes and Standards:
 - 1. Aluminum Association Aluminum Construction Manual
 - 2. American Society of Civil Engineers Proceeding Paper 970
 - 3. American Society for Testing and Materials See Metals Section 05000
 - 4. American Welding Society "Structural Welding Code"
 - 5. National Association of Architectural Metal Manufacturers "Metal Bar Grating Manual"
 - 6. Occupational Safety and Health Administration
 - 7. International Building Code, New Jersey Edition, 20015
- b. In the case of conflicting requirements in any of the above listed Codes and Standards, the most stringent is to govern.

1.03 STANDARD REQUIREMENTS

- a. Aluminum in contact with concrete, masonry or dissimilar metals is to be protected by paint such as zinc chromate or a bituminous coating, or by isolating micarta strips where appropriate.
- b. Aluminum work is to be mill finished.
- c. All joints between dissimilar materials, which react electrolytically, are to be separated with appropriate insulators, such as micarta strips, or protected with zinc chromate primer, as directed.

1.04 <u>SUBMITTALS</u>

a. Shop drawings, tests, certifications and product literature are to be submitted for record and approval purposes. No fabrication, delivery or installation is to begin without the Engineer's review completed.

PART 2 PRODUCTS

2.01 LADDERS

All aluminum construction; mill finish; side rails to be 2¹/₂" x ¹/₂", 6061-T6 alloy; rungs to be 1" square, solid aluminum, 6061-T6 alloy bar of non-skid design; rungs shall be covered with "SlipNOT Ladder Rung Cover" as manufactured by SlipNOT, or equal; rungs shall be Grade 3, course texture, with a anti-slip surface consisting of aluminum oxide particles 8 to 10 matrix, and a coefficient of friction

less than 0.6; rungs covers shall be bonded to rung a minimum of 2,000psi as per ASTM C633; rungs to be welded to side rails; rungs to be spaced at 12" on center with a minimum 18" clear width between side rails; wall anchors to be 6061-T6 alloy of bent 6" x 4" x 2" size; wall anchors to be spaced at six (6') foot maximum centers; all connections to be neatly welded with all welds ground smooth and polished. All aluminum shall be free from blemishes or defects of any type that can affect durability, strength or appearance.

2.02 LADDER SAFETY POST

a. Shall be "LadderUP" model "LU-4," as manufactured by The Bilco Company, or equal. Post shall be high-strength aluminum 6061-T6 square tubing, with a mill finish. Post shall be retractable, and shall automatically lock when fully extended. Post shall extend at least 42" above top of hatch in raised position, and shall bear a pull-up loop at the top end. Provide a stainless-steel spring balancing mechanism to allow for a smooth, controlled operation when raising and lowering the safety post. Spring nuts shall be galvanized steel; all other mounting hardware shall be Type 316 stainless steel. Product shall come pre-assembled from the manufacturer.

2.03 BAR SCREEN BASKET

a. Shall be model "B6B" as manufactured by Halliday Products, Inc., or equal. The basket system shall be of the bar screen style basket, having 2" clear opening between ¼" thick bars and solid sides. The heavy-duty ladder/guide rail system shall be of 3" structural channel and incorporate slip resistant rungs 12" on center. For ease of operation, the basket shall have four 2-½" solid wheels with ½" stainless steel axles. A basket stop shall be supplied loose for field mounting to insure proper basket position.

2.04 <u>CASTINGS</u>

a. Watertight, cast iron or ductile iron; manhole frames and covers, valve boxes, curb pieces, and other castings of like nature to be as manufactured by Campbell Foundry Company, or equal.

2.05 FOUNDATION BOLTS

a. All anchor bolts shall be set to the dimensions given on the shop drawings and shall be positioned by use of a template. In case of heavy equipment, it is recommended that anchor bolts be set in pipe sleeves and grouted upon completion of equipment installation. Such pipe sleeves are to be used to provide flexibility in the installation. Embedment depths are to be maintained from bottom of pipe sleeve. All anchor bolts are to be provided with adjusting nuts and washers for leveling the equipment. Stainless steel anchor bolts are to be installed for all equipment, consisting of stainless steel threaded top bolts, washers and shims, pinned to a carbon steel lower bolt by means of a carbon steel union.

2.06 MANHOLE STEPS

a. Manhole steps shall be reinforced steel, copolymer polypropylene, 14" wide, M.A. Industries Inc, PF Series or equal. Copolymer polypropylene shall conform to ASTM D4101 Classification PP0344 B33534 Z02. Steel reinforcing shall be 1/2-in diameter, conforming to ASTM A615, Grade 60, and shall be continuous throughout step. The manhole steps shall meet all OSHA requirements.

2.07 FASTENERS AND SUPPORTS

a. Fasteners of stainless steel nuts, bolts and washers; sufficient in size and number to transmit all loads normally anticipated. Supports are to be threaded rod, end-thread rod or rolled structural elements of aluminum; all suitably sized and located to carry or support intended loads.

2.08 SPECIAL FABRICATIONS

a. Steel, aluminum or stainless steel shall be detailed in accordance with best industry practice and suitable for the use intended.

2.09 STAIR NOSINGS

- a. Embedded anchor type.
 - 1. Stair nosings: Balco Inc. "DXH-330," or equal; two (2) component, non-slip type ³/₈" thick by 3" deep, length to be full width of stair tread minus three (3") inches on either side.

2.10 ACCESS HATCHES

- a. Access hatches shall be single leaf Type J, as manufactured by Bilco Company, or equal. Access hatch shall provide compression spring operators enclosed in telescopic tubes for smooth, easy and controlled door operation throughout the entire arc of opening and closing; operation shall not be affected by temperature. Hatch shall be engineered with compression spring operators enclosed in telescopic tubes and automatic hold-open arm with grip handle release for smooth, easy one-hand door operations. Hatch shall be corrosion resistant.
- b. Hatch cover and frame material shall be ¼" thick minimum. Cover shall be a diamond pattern plate and reinforced to withstand a live load called for on Drawings, or a minimum of 300 pounds per ft² with a maximum deflection of 1/150th of the span. Frame shall be fabricated with bend down anchor tabs around the perimeter; a 1-½" drain coupling shall be located in the front right corner of the frame. Gasket shall be EPDM gasket mechanically attached to the frame. Hinges shall be with Type 316 stainless steel hinge pins. Latch shall be Type 316 stainless steel slam lock with fixed interior handle and removable exterior turn/lift handle; latch release is to be protected by a flush, gasketed, removable screw plug. Hardware shall be in accordance with Manufacturer's instructions; Manufacturer shall guarantee against defects in material or workmanship for a period of five years. The Contractor shall submit designs for special units where indicated on the Drawings.
- c. Materials shall be as shown on the drawings.

PART 3 EXECUTION

3.01 <u>GENERAL REQUIREMENTS</u>

a. All work is to be performed in strict conformance with OSHA, NAAMM, ASCE, AA, AWS, ASTM, Local Building Codes, Safety Codes and the Contract Documents.

END OF SECTION

SECTION 10520 FIRE EXTINGUISHERS

PART 1: GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, equipment and materials required for the installation of safety equipment in the locations specified and designated by the Engineer. The use of any such safety equipment by the Contractor or his forces shall not be permitted.

1.02 <u>SUBMITTALS</u>

Submit material specifications and shop drawings for all materials furnished under this section

PART 2: PRODUCTS

Safety equipment is to conform to the following design criteria:

- a) Fire Extinguisher, Walter Kidde and Company, or equal, Model No. "466204TCM", to be wall hung, on the inside of pump station control panel as shown on Drawings, with suitable plated steel strap hardware; one unit required at each pump station.
- b) First Aid Kit, Mine Safety Appliance, Inc., or equal, Model No. "2007", complete; to be compactly arranged in a 20-gauge steel case; wall mounted and removable; to contain a variety of bandages, gauze, dressings, inhalants, swabs, adhesive tapes and ointments; one unit required at each pump station.

PART 3: <u>EXECUTION</u>

All products are to be used in strict accordance with the manufacturer's published literature and the Contract Documents.

Catalog cuts, product literature, and other necessary data are to be submitted for record and approval. No safety equipment is to be delivered or installed without the Engineer's review and approval.

END OF SECTION

SECTION 11001 SUBMERSIBLE PUMPS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- a. The Contractor shall furnish six (6) and install four (4) new submersible, explosionproof, non-clog sewage pumps as shown on the Drawings and specified herein, including motor, close coupled volute, cast iron flanged discharge elbow, guide bar and brackets, lifting chain, power cable, and accessories. The complete installation includes, but is not necessarily limited to, procurement, delivery, unloading, preparation, installation, testing and troubleshooting.
- b. The Contractor shall furnish and install one explosion-proof submersible sump pump in the valve chamber as shown on the Drawings and specified herein. The complete installation includes, but is not necessarily limited to, procurement, delivery, unloading, preparation, installation, testing and troubleshooting.

1.02 <u>SUBMITTALS</u>

- a. Data to be submitted:
 - 1. Pump curves for the units, showing Total Dynamic Head, Shut-Off Head, Net Positive Suction Head Required, Pump Efficiency, Brake Horsepower, Power Input to Electric Drive Motor and Overall Efficiency (wire to water efficiency) of Pumping Unit for the various conditions under which the units are to operate along with descriptive data and specifications describing in detail the construction of the complete units. Suction Specific Speed and vane overlap of the impeller shall be submitted for the pumps. Curves for a minimum of five (5) operating speeds shall be provided.
 - 2. The manufacturer shall furnish evidence that he has equipment of a similar type in satisfactory operating condition for not less than 5 years. A list giving locations and date of installation shall be furnished to the Engineer.
 - 3. The Contractor shall submit a certification executed by the pump manufacturer stating that the pumps and motors are configured for variable frequency drive operation.
 - 4. Any programs associated with the panels shall be submitted in electronic form and hard copies.
 - 5. Three (3) hard copies and one (1) electronic copy of the operation and maintenance manuals shall be provided .
 - 6. Electrical Motor Data.
 - 7. Technical Manuals.
 - 8. Parts list.
 - 9. Printed warranty.
 - 10. Manufacturer's equipment storage recommendations.

- b. Dimensional Data:
 - 1. Submit to the Engineer for approval, shop drawings certified as correct, showing all weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.
 - 2. Station drawing for accessories.
 - 3. Access frame drawing.
 - 4. Control drawing and data.
 - 5. Submit anchor bolt sizes, depth of embedment, shear, and pullout strength for approval.
 - 6. Typical installation guides.
 - 7. Manufacturer's Standard Recommended Start-Up Report Form.

1.04 <u>QUALITY ASSURANCE</u>

- a. The Submersible Pumping units shall conform to all applicable requirements of NEMA, NEC, SWPA and the Hydraulic Institute. For purposes of this specification, the revision and/or version of the referenced standards in effect shall apply.
- b. Each pump shall be shop tested in the manufacturer's shop, in accordance with the test code of the Hydraulic Institute and as specified herein
- c. Pump Testing:
 - 1. General: Tests shall be performed on the actual assembled unit from shut-off head condition to 25 percent above the required design capacity. Prototype model tests will not be acceptable. Pump shop tests shall be performed by the manufacturer and certified curves shall be submitted to the Engineer. No equipment shall be shipped until the test data is acceptable to the Engineer.
 - 2. Factory Tests of Pumps: All pumps and motors shall be factory-tested in accordance with the Specifications. Three sets of certified test data shall be submitted to the Engineer. This data shall include, but not limited to the following:
 - a. Hydrostatic test of each pump casing at no less than 1.5 times the shut off head shown on the characteristic curves for at least ten minutes.
 - b. Hydraulic test at rated full speed with a minimum of 7 readings between shutoff head and 25-percent above design capacity including the specified operating conditions of head and capacity, recorded on data sheets as defined by the Hydraulic Institute, signed, dated, and certified.
 - c. Certified pump tests shall be conducted through the specified range of flow vs. head/capacity/efficiency curves plotted at pump design speed. During each test, the pump shall be run at each head/capacity condition as specified in the pump schedule for sufficient time to accurately determine and record capacity, head, input power and overall efficiency. The pump shall be tested with a submergence as required to demonstrate that the submergence required by the

pump at the operating point(s) listed in the pump schedule will be satisfied by pump settings furnished.

- 3. Tolerances allowed for acceptance of pump will be +10% and -0% on head at the rated flow and +10% and -0% on flow at the rated head (pump must meet both criteria to be considered acceptable).
- 4. The Contractor shall be responsible for the coordination of the tests. A description of the manufacturer's test equipment and test procedures shall be submitted and approved prior to conducting the test.
- 5. Mechanical and electrical integrity shall be established both before and after testing by physical inspection and by use of a megger.
- 6. A failure of any pumping unit meeting the operating requirements specified, for any reason, shall be considered an incomplete test. Upon correction of the problem causing failure, the pumping unit shall be re-tested.
- d. Warranty:
 - 1. The pumps and motors will be covered by a full five- (5) year 100% non-prorated warranty covering all parts and labor. This warranty shall not be limited by hours of running time or operation from variable frequency drives.
 - 2. Additionally, the pump manufacturer shall warrant the mechanical seal to be free from defects in materials and workmanship and against wear for the life of the pump. Should the mechanical seal fail due to normal use, the pump manufacturer shall repair or replace the seal. This warranty shall include 100% of the manufacturer's costs for parts and labor and shall be in written form and shall be from the pump manufacturer to the Owner. Warranties from component providers, manufacturers' representatives or other third parties shall not be acceptable.

PART 2 - PRODUCTS

2.01 <u>GENERAL</u>

- a. All iron and steel products included in this section shall be manufactured in the US. Refer to Section 00800 for further description of the American Iron and Steel requirement.
- b. The sewage pumping units shall be vertical, non-clogging, heavy duty, electric submersible centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be designed for handling raw, unscreened domestic sewage and wastewater and shall be fully guaranteed for this use.
- c. The pumps shall be identical and shall be direct driven by integral squirrel cage, electric induction, explosion proof motors. Each pump shall include a motor, bearings, discharge elbow, anchor bolts, spare parts, and all accessories specified herein. The pumps shall be capable of operating in an ambient liquid temperature of 104° F.

- d. The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.
- e. All pumps shall be designed to pump solids and materials normally found in municipal raw sewage. Solids handling capabilities are specified in another section. Solids passage shall include both the pump volute and impeller.
- f. The submersible motor shall be connected for operation on electric service as specified in Table 1 in Section 2.03. The power and control cable shall be sized in accordance with NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The motor shall be inverter duty rated for pumps with VFDs.
- g. The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project.
- h. All pump equipment to be located in the wet well shall be suitable for use under corrosive conditions.
- i. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to 104° F. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be provided in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel.
- j. The pumps shall be automatically and firmly connected to the discharge connection, guided by guide rails extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. No portion of the pump shall bear directly on the sump floor.
- k. The pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.
- 1. The pumps shall be the submersible type capable of operation fully submerged to a depth of 65 ft. normally. The pump motors shall be guaranteed to run at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged continuously for 24-hour operation without damage, overheating, or overloading.
- m. All major components of the pumping unit, i.e., volute casing, stator housing, sealing chamber, etc., shall be manufactured from close-grained cast iron. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel. All mating surfaces requiring a watertight seal shall be machined and fitted with Buna-n O-rings.
- n. The pumps shall be furnished with standard Class 125 ANSI flanges that are capable of flange mounting.

o. Each pump shall have stainless steel nameplate indicating the HP, amps, voltage, phase, RPM, insurance class, serial number, model number, gpm, TDH, and impeller size.

2.02 <u>MANUFACTURER</u>

a. Pumps shall be wet-pit submersible non-clog sewage pumps model NP 3069 SH 3~ 275 impeller diameter 115 mm, as manufactured by Flygt Corp, or equal.

2.03 DESIGN CONDITIONS

a. Pumps shall be designed and constructed to satisfactorily meet the design conditions and requirements specified in Table 1.

ITEM	Valley View Circle Pump Station	Piper/Apricot Pump Station
Liquid (to be pumped)	Raw Sewage	Raw Sewage
Number of pumps	Three - Two installed, One spare	Three - Two installed, One spare
Number of "on-shelf" pumps	One	One
Pumps in Operation (at Peak Design Flow)	One	One
Design Point		
Q (gpm)	75	65
TDH (ft)	51	53
Min. Hydraulic Efficiency (%)	37	33
Min. Shutoff Head (ft)	64	64
Discharge Connection (inches)	3	3
Max. Motor Horsepower (nameplate)	2.7	2.7
Electrical Voltage and Motor Characteristics	230 V, 3-ph	230 V, 3-ph
Maximum Motor Speed (rpm)	3340	3340
Motor Service Factor	1.1	1.1

TABLE 1

Anticipated Number of		
Starts per Hour	5	2

Pump Design Flow per pump at pump motor speed of 60 Hz.

b. For both pump stations, length of power and sensor cable shall be as required to extend from the pump to the junction box without splicing. Length to be determined by Contractor. See Drawings for details.

2.04 <u>PUMP CONSTRUCTION</u>

- a. Pump Design Configuration
 - 1. The pump shall be supplied with a mating cast iron discharge connection. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two 2-inch guide bars extending from the top of the station to the discharge connection. Guide bars shall be aluminum or stainless steel. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.
- b. Pump Construction
 - 1. Major pump components shall be of grey cast iron, ASTM A-48, Class 30B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the sewage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
 - 2. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
 - 3. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.
- c. Cooling System
 - 1. Motors shall be sufficiently cooled by the surrounding environment or pumped media. A water jacket shall not be required.
- d. Cable Entry Seal
 - 1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical

elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

- e. Motor
 - 1. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class F insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be cold pressed into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel.
 - 2. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.
 - 3. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.11. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.
 - 4. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

- 5. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.
- 6. Motor shall be rated for inverter duty for VFD operation.
- f. Bearings: The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper and lower bearings shall be single row shielded ball bearings.
- g. Mechanical Seal
 - 1. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.
 - 2. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to affect sealing shall be used.
 - 3. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.
 - 4. Seal lubricant shall be FDA Approved, nontoxic.
- h. Pump Shaft
 - Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel

 ASTM A479 S43100-T. The use of stainless-steel shaft sleeves will not be accepted.
- i. Impeller: The impeller shall be of hard iron (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned automatically upon

each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the gray iron impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

- j. Volute / Suction Cover: The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of hard iron (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.
- k. Protection
 - 1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.
 - 2. A leakage sensor shall be provided to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. Use of voltage sensitive solid-state sensors and trip temperature above 125°C (260°F) shall not be allowed.
 - 3. The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.
- Explosion-Proof Pumps: The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to 104 °F. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be available in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel. The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion- proof pumps.
- m. Pump Lift System: Furnish with each submersible pump one complete Flygt-Lift system or equal. The system shall consist of 35 ft. nylon line, short length of high tensile strength proof-tested chain and forged steel Grip-Eye for use with mechanical lifting device. System shall be appropriately sized by the pump manufacturer for weight of pump to be lifted.
- n. Power and Control Cables
 - 1. Power and control cables shall be furnished in lengths to run un-spliced from the

pump to the pump control panel as shown on the Drawings and as specified herein. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to confirm that all strands of each conductor is terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.

- 2. Cables shall be of the "SO" type and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the pump through a heavy-duty galvanized cast iron entry assembly which shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.
- 3. The cables for each pump shall pass through the galvanized cast iron strain relief component and then through a series of stainless-steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. These components shall work to compress the cable jacket by the inner diameter of the grommet while the outer diameter of the grommet seals against the inside surface of the cable entry chamber in the top of the motor.
- o. Spare Parts
 - 1. The following spare parts listed shall be supplied as part of the installation for each pump station:
 - a. One impeller and casing wear rings
 - b. One set of gaskets and O-rings for each pump
 - c. Set of bearings for each pump
 - d. One set of mechanical seals complete, both upper and lower sets for each pump.

2.05 <u>EXPLOSION PROOF SUMP PUMP (IN VALVE CHAMBER)</u>

- a. Pump:
 - 1. Manufacturer: Liberty Pump Model ISS Series or equal
 - 2. Design Point: 82 GPM @ 10 Feet of Head
 - 3. Impeller 7 Vane Class 25 Cast Iron
 - 4. Solids Handling Size 3/4-inch
 - 5. Paint Powder coat
 - 6. Max. Liquid Temp. $-40 \text{ }^{\circ}\text{C} (104 \text{ }^{\circ}\text{F})$
 - 7. Max Stator Temp 130 °C (266 °F)
 - 8. Thermal Overload $105 \degree C (221 \degree F)$
 - 9. Power Cord Type 500W
 - 10. Motor Housing Class 30 Cast Iron
 - 11. Volute Class 30 Cast Iron
 - 12. Shaft Stainless Steel
 - 13. Hardware Stainless Steel
 - 14. O-Rings Buna-N
 - 15. Mechanical Seal Upper Unitized Silicon Carbide
 - 16. Mechanical Seal Lower 2 Piece Silicon Carbide
 - 17. Min Bearing Life 50,000 hours
 - 18. Pump Legs Cast Iron
- b. Motor:

- 1. 0.5 Horsepower, 115 Volt, Single Phase
- 2. Oil Filled
- 3. Permanent Split Capacitor
- 4. Class F Insulation
- 5. Nema B Design
- 6. Continuous Duty
- 7. Integral Thermal/Current
- 8. Overload Switch
- c. Control Panel:
 - 1. Intrinsically Safe
 - 2. Motor Operation Relay
 - 3. Float Activated
 - 4. Hand-off automatic switch
 - 5. Motor Protective Switch
 - 6. Auxiliary Contact for Alarm

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- a. Field Testing:
 - 1. After the installation of the pumps, controls and all appurtenances, and when construction of other units of the pump station will permit, each complete pumping unit will be subject to field tests as specified herein under actual operating conditions.
 - 2. Field Tests: All pumping units shall be field tested to demonstrate satisfactory operation, without causing excessive noise, vibration, and cavitation. The experienced field representative of the manufacturer who shall supervise the tests shall certify in writing that the equipment and controls have been properly installed, lubricated, adjusted, and readied for operation.
 - 3. After the pumps have been completely installed and wired, the Contractor shall have the manufacturer do the following:
 - i. Megger stator and power cables.
 - ii. Check seal lubrication.
 - iii. Check for proper rotation.
 - iv. Check power supply voltage.
 - v. Measure motor operating load and no-load current.
 - vi. Check level control operation and sequence.
 - 4. The field tests shall also demonstrate that under all conditions of operation each unit:
 - i. Has not been damaged by transportation or installation.
 - ii. Has been properly installed.
 - iii. Has no mechanical defect.
 - iv. Is in proper alignment.
 - v. Has been properly connected.
 - vi. Is free of overheating of any parts.
 - vii. Is free of all-objectionable vibration and noise.
 - viii. Is free of overloading of any parts.
 - 5. The field testing shall be witnessed by the Owner or its representative. In the event

any of the pumping equipment fails to meet the above test requirements, it shall be modified and retested in accordance with the requirements of the Specifications. The Contractor shall then certify in writing that the equipment has been satisfactorily tested, and that all final adjustments thereto have been made. Certification shall include date of final acceptance test, as well as a listing of persons present during tests, and resulting test data. The costs of all work performed in this paragraph by factory-trained representative shall be borne by the Contractor.

b. Acceptance: In the event of failure of any pump to meet any of the above requirements or efficiencies, the Contractor shall make all necessary modifications, repairs, or replacements to conform to the requirements of the Contract Documents and the pump shall be re-tested at no additional compensation, until found satisfactory.

3.02 <u>PROTECTIVE COATING</u>

- a. All exposed materials, except corrosion-resistant metals which have not been shop painted, shall be field painted. Shop painted items which suffered damage to the shop coating shall be touched up.
- b. Bearing surfaces and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. The coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance.

3.03 MANUFACTURER'S FIELD SERVICES

- a. The pump supplier shall provide the services of a factory trained technician to provide the following services. Three (3) visits to the job site shall be provided, each a minimum of one (1) full day, or longer, if required.
 - 1. Instruct the Contractor on proper installation of the equipment
 - 2. One day or one job site visit for pre startup assistance
 - 3. One day or one job site visit for start-up of pumps, controls and all other equipment supplied, and to supervise and assist the Contractor with field testing as specified in section 3.02.
 - 4. One day or one job site visit to instruct owner's personnel on the operation and maintenance all equipment supplied
- b. The technician shall be fully trained in the installation, operation and maintenance of the pumps, controls and all other equipment supplied. A resume and factory training certification for all equipment being provided shall be included in the submittal package. The pump technician must have at least five years of experience servicing pumps and be a full-time service employee. Start-up services by salespersons are not acceptable. The technician shall perform the following tests after the pumps have been completely installed and wired:
 - 1. Megger stator and power cables.
 - 2. Check seal lubrication.
 - 3. Check for proper rotation.
 - 4. Check power supply voltage.
 - 5. Measure motor operating load and no-load current.
 - 6. Check level control operation and sequence

- 7. Check functioning of seal fail devices
- 8. Check impeller adjustment against specifications
- 9. Check for debris in station that may damage pumping equipment
- 10. Check for proper functioning of guide rail system by raising and lowering the pump while submerged.

END OF SECTION

SECTION 13450 PROGRAMMABLE LOGIC CONTROLLER (PLC) HARDWARE

PART 1 - GENERAL

1.01 <u>REFERENCES</u>

- a. National Fire Protection Association (NFPA):
 - 1. 70 National Electrical Code (NEC)
 - 2. 70E Standard for Electrical Safety in the Workplace
 - 3. 79 Electrical Standard for Electrical Machinery
- b. The Institute of Electrical and Electronics Engineers (IEEE)
- c. International Society of Automation (ISA)

1.02 <u>QUALITY CONTROL</u>

- a. The Control System Integrator shall conduct Factory Acceptance Test of the PLCs prior to shipment to the field and installation. The FAT shall meet the following:
 - 1. The intent of the FAT shall be to test both the hardware and the PLC logic. Coordinate hardware testing with software testing. Refer to the applicable Functional Design Specification (FDS) for the system to which the PLC controls.
- b. The Control System Integrator shall conduct field startup and commissioning of the PLCs.
- c. The Control System Integrator shall conduct Site Acceptance testing of all PLCs.
- d. The Control System Integrator shall demonstrate, to the satisfaction of the Engineer, that materials and operational programming meet the intent of the Contract Documents.
- e. The Control System Integrator shall remove or replace any materials or programming (including "dead code") that does not comply with the Contract Documents. Programming shall include any application software that is loaded into the PLC.

1.03 <u>SUBMITTALS</u>

- a. Catalog information, product data sheets, and or descriptive literature of all programmable logic controller hardware.
- b. Records of installation, compliance, and final configuration settings of all equipment installed or utilized under this Section as required.

1.04 <u>DELIVERABLES</u>

- a. Records of installation, compliance, and final configuration settings of all equipment installed or utilized under this Section as required.
- b. Provide as-built/record versions of all shop drawings and detailed design documentation.

PART 2 - PRODUCTS

2.01 <u>GENERAL</u>

- a. The PLC shall be an integrated, modular, chassis type system designed for mounting the CPU (processor) module, I/O modules, communication modules, and power supply unit. The PLC shall be Schneider-Modicon Model M580 or a Schneider-Modicon Model M340 or Equal.
- b. Programmable logic controllers shall be provided and installed in the locations shown on the Drawings. The PLCs shall be intelligent systems capable of performing both data acquisition and process control functions. Each shall have the ability to function independently, without connection to the operator interface terminals, the human machine interface stations, or other programmable controllers. The control system architecture shall be as shown on the Drawings and described herein.
- c. The basis of design for this project is to provide Redundant Modicon M580 programmable logic controllers as manufactured by Modicon-Schneider Electric or Equal. The new PLCs will be integrated into the District's existing SCADA system, which includes an industrial Ethernet communications network and human machine interface (HMI) system.
- d. The PLC shall be capable of operating in an industrial environment without the use of additional fans, air conditioning or additional electrical filtering. The PLC system shall have an operational temperature range from 0° to 60° C, and a humidity range from 0% to 95% (non-condensing).

2.02 PROCESSOR (CPU)

- a. The PLC system shall execute logic in a single processor module. The processor shall be capable of executing all monitoring and control functions required by the Specifications and Drawings.
- b. The processor shall have the ability to run multiple tasks with the ability to run each task at a particular scan rate that may be updated while running with the ability to prioritize each task.
 - 1. Processor Features
 - a. Unless specified otherwise, the processor shall have a minimum of 16 GB of base program and data memory. Specified memory capacity shall be available entirely

for storing the operational control program. Specified spare capacity and executive or "housekeeping" programs shall not be counted in memory size rating.

- b. A non-volatile memory card (SD Card) shall store the entire user program and configuration, and shall be capable of reloading the program into RAM if a fault in the program is detected or if the program is lost due to loss of power or other means. Unless specified otherwise, the non-volatile memory card shall have a minimum of 16 GB of memory.
- c. As a minimum, the processor shall be provided with the following integrated communication ports:
 - 1) One (1) USB Type Mini-B Port
 - 2) One (1) Ethernet TCP/IP Service Port
 - 3) Two (2) TCP/IP Device Network Port
 - 4) One (1) Ethernet Hot Standby Port
- d. The processor will be capable of being programmed with a general-purpose laptop computer.
- e. The PLC shall have status lights to indicate various functions, including run, processor fault, I/O fault, and communication activity.

2.03 <u>I/O MODULES</u>

a. GENERAL REQUIREMENTS

- 1. PLC I/O modules shall be provided as required to accept signals as indicated on the Drawings, as specified in Specifications for equipment, and as specified herein. I/O modules shall be provided to accept all active signals and all specified spares. PLC I/O modules, including installation in the PLC enclosure shall conform to the following:
 - a. All I/O modules shall be enclosed in a plastic housing. I/O modules shall be plugged into a modular type I/O rack with common backplane. All cables required to connect to all other PLC system components shall be provided.
 - b. I/O modules shall be capable of being removed and inserted into the I/O rack under power without affecting any other I/O modules in the rack.

b. BASIC I/O MODULES

- 1. The manufacturer shall have available a variety of I/O modules for the PLC. I/O modules shall be selected as required for the application as shown on the design drawings. Unless specified otherwise, basic I/O modules shall conform to the following:
 - a. Discrete Inputs
 - 1) Discrete inputs shall be 24VDC positive (sinking) logic unless otherwise shown on the Drawings.
 - 2) The discrete input module shall have sixteen isolated inputs with a single common connection.
 - 3) The discrete input module shall be provided with a removeable terminal block with cage clamp connections

- 4) The discrete input module shall be provided with the following status LED's:
 - a) Green RUN
 - b) Red ERR
 - c) Red I/O
 - d) Green Per Channel Diagnostic
- b. Discrete Outputs
 - 1) Discrete outputs shall be 24VDC solid state with positive logic unless otherwise shown on the design drawings.
 - 2) Discrete outputs shall have an output current rating of 0.5 Amps.
 - 3) The discrete output module shall have sixteen isolated outputs with a single common connection.
 - 4) The discrete output module shall be provided with a removeable terminal block with cage clamp connections.
 - 5) The discrete output module shall be provided with the following status LED's:
 - a) Green RUN
 - b) Red ERR
 - c) Red I/O
 - d) Green Per Channel Diagnostic
- c. Analog Input
 - 1) Analog input modules shall be eight (8) channel, 4-20mA DC (+/- 10V), with input impedance of 250 ohms per channel.
 - 2) Analog input modules shall be provided with analog/digital (A/D) conversion resolution of 15 bit + sign.
 - 3) The analog input module shall be provided with a removeable terminal block with cage clamp connections.
 - 4) The analog input module shall be provided with the following status LED's:
 - a) Green RUN
 - b) Red ERR
 - c) Red I/O
 - d) Green Per Channel Diagnostic
- d. Analog Outputs
 - 1) Analog output modules shall be four (4) channel, with each channel capable of driving a 4-20mA DC signal (+/- 10V) into a 0 to 500 ohm load.
 - 2) Analog output modules shall be provided with digital/analog (D/A) conversion resolution of 15 bit + sign.
 - 3) The analog input module shall be provided with a removeable terminal block with cage clamp connections.
 - 4) The analog output module shall be provided with the following status LED's:
 - a) Green RUN
 - b) Red ERR
 - c) Red I/O
 - d) Green Per Channel Diagnostic

- e. Temperature Inputs
 - 1) Temperature input modules shall be eight (8) channel and shall be suitable for thermocouple or milli-volt inputs.
 - 2) Temperature input modules shall be provided with digital/analog (D/A) conversion resolution of 15 bit + sign.
 - 3) The temperature input module shall be provided with a removeable terminal block with cage clamp connections. The analog output module shall be provided with the following status LED's:
 - a) Green RUN
 - b) Red ERR
 - c) Red I/O
 - d) Green Per Channel Diagnostic

c. COMMUNICATIONS

- 1. Communications shall be capable of using Modbus, and open industry standard Ethernet/IP and OPC protocols.
- 2. The PLC shall be capable of peer-to-peer communications that provide for the direct transfer of process data between controllers without the use of gateways or servers.
- 3. PLC chassis shall be capable of containing one or more communication modules to provide communication interfaces to other devices, including, but not limited to: remote work stations, HMIs, and PLCs by other manufacturers. As a minimum, the PLC shall support the following without the need for third-party modules:
 - 1) Ethernet (10/100MB).
 - 2) Serial protocols including Modbus and ASCII.

d. BACKPLANES

1. The PLC shall be provided with a backplane to mount the processor module, I/O modules, communication modules, and other applicable modules. The backplane shall be modular, capable of accepting any module into any slot. The backplane shall provide a high-speed communication path between modules and distribute power to each of the modules within the backplane. Modules shall be secured to the chassis via a screw connection. The chassis shall be available in various slot configurations, up to a total of 12 slots.

e. POWER SUPPLIES

- 1. Each PLC backplane shall be provided with a regulated power unit designed to operate the PLC system. The power supply unit shall conform to the following:
 - a. The power supply unit shall mount directly to the backplane and connect to the backplane.
 - b. The power supply shall provide power to the PLC system, including the controller processor, I/O modules, communication modules, and other applicable modules.
 - c. The power supply shall be capable of supplying PLC system power when all the specified spare I/O capacity is utilized.

- d. The power supply shall be sized to carry no more than 75 percent of total unit capacity under normal loads, including all spare capacity.
- e. Unless specified otherwise, the input power to the power supply shall be 24VDC, +/- 10 percent.

f. PLC I/O LIST FOR ULTRASONIC SENSOR IN WET WELL

INPUT Level 1	OUTPUT Alarm to Beacon Alarm to Auto Dialer
Level 2	Lead pump off
Level 3	Lag Pump Run
Level 4	Lead pump run
Level 5	High alarm to Auto Dialer High Level Alarm To Alarm Beacon

2.04 PLC SOFTWARE GENERAL REQUIREMENTS

- a. The Control System Integrator shall provide means for themselves to program and commission the PLC applications.
- b. PLC programming software shall be as provided by the PLC manufacturer and shall be the most current version. Third party programming software shall not be acceptable.

PART 3 - EXECUTION

3.01 SEQUENCE OF OPERATIONS

- a. Wet Well (Piper Road Pump Station & Valley View Pump Station):
 - 1. The pumping system shall consist of two submersible sewage pumps with an alternator to balance pump operation. The pumps shall be 240 volt, 3 phase, 2.7 horsepower. The pumps shall have integral overtemperature and leak detection sensors.
 - 2. Pump control shall consist of an ultrasonic level sensor and a PLC panel mounted interface.
 - 3. The pumps shall be controlled using an ultrasonic level sensor that monitors liquid level. The level sensors shall send a signal to the PLC based on heights established on Drawings M401 and M402. The pumps shall alternate in the lead-lag operation.

- 4. The pumping system shall have a back up high level float that sends a signal to the auto dialer and alarm beacon.
- 5. The PLC shall provide control and monitoring as noted in the PLC I/O list.
- b. Valve Chamber (Piper Road Pump Station & Valley View Pump Station):
 - 1. The pumping system shall consist of one submersible sump pump. The pump shall be 115 volt, 1 phase, 0.5 horsepower.
 - 2. Pump control consists of a sump pump and control panel. A float switch shall monitor level in the valve chamber sump and shall send a signal to the sump pump control panel located in the pump station control panel.
- c. Valve Chamber Flow Meter (Piper Road Pump Station & Valley View Pump Station):
 - 1. The valve chamber flow meter shall transmit continuous measured flow to the PLC for twelve months storage at a minimum.

END OF SECTION

SECTION 13700 VIDEO SURVEILLANCE

PART 1 - GENERAL

1.01 <u>DEFINITIONS</u>

- a. TRUE Day/Night (infrared sensitive): A camera that has normal color operation in situations where there is sufficient illumination (day conditions), but where the sensitivity can be increased when there is little light available (night conditions). This is achieved by removing the infrared cut filter required for good color rendition. The sensitivity can be further enhanced by integrating a number of fields to improve the signal-to-noise ratio of the camera.
- b. H.265 (also known as MPEG-H Part 2): a powerful encoding format that has become the successor to H.264 (MPEG-4 Part 10) standard. Recording video in H.265 format requires approximately 50% less storage than video recorded with H.264.
- c. Privacy Masking: The ability to mask out a specific area to prevent it from being viewed.

1.02 **QUALIFICATIONS**

- a. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- b. Supplier: Authorized distributor of specified manufacturer with minimum 5 years documented experience.
- c. Installer: Authorized installer of specified manufacturer with 5 years documented experience and service.

1.03 <u>SUBMITTALS</u>

- a. Shop Drawings: Indicate electrical characteristics and connection requirements, including system wiring diagram.
- b. Operation and Maintenance Data: Submit instructions for operating system and performing routine trouble shooting procedures.

1.04 <u>MAINTENANCE SERVICE</u>

- a. Make ordering of new equipment for expansions, replacements, and spare parts available to Owner.
- b. Provide factory direct technical support via phone and e-mail.
- c. Furnish service and maintenance of video surveillance system for one year from Substantial Completion

PART 2 - PRODUCTS

2.01 <u>MANUFACTURERS</u>

- a. Camera: "Uniview Technology" model "IPT4E28" or Equal.
- b. Recorder: "Digital Watchdog" model "DW-VP92T4P 9Ch VMAX IP Plus NVR w/4 PoE" or Equal.

2.02 <u>CAMERA</u>

- a. Product Description: 4MP Resolution, TRUE Day/Night, D-WDR, IR, Turret, IP Camera
- b. Camera Image Sensor: 1/3" CMOS
- c. Lens: 2.8mm fixed, F2.0
- d. General Characteristics:
 - 1. The IP turret camera shall provide protection against water and dust ingress up to IP 67 (NEMA 4X) standards.
 - 2. The IP turret camera shall utilize 1/3-inch CMOS sensor capable of producing up to 2592 x 1520 resolution.
 - 3. The IP turret camera shall provide direct network connection using H.265, Ultra H.265, H.264 and MJPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
 - 4. The IP turret camera shall offer Progressive Scanning for sharper video motion images.
 - 5. The IP turret camera shall offer Power over Ethernet (IEEE 802.3af).
 - 6. The IP turret camera shall be ONVIF Profile S compliant.
 - 7. The IP turret camera shall offer digital wide dynamic range technology that allows for the capture of bullet clear images from both light and dark areas in the same scene.
 - 8. The IP turret camera shall provide eight independent, fully programmable privacy mask areas.
 - 9. The IP turret camera shall have a fixed 2.8mm lens.
 - 10. The IP turret camera shall provide an on-screen display to simplify the camera/lens adjustments and network configuration settings.
 - 11. The IP turret t camera shall provide IR LED lights for 0 Lux night time operation up to 98 feet (30m).
- 12. The IP turret camera shall provide a color image with a minimum scene illumination of 0.03 Lux and a monochrome image, when in the night mode and the IR LED's on, with a minimum scene illumination of 0.0Lux.
- 13. The IP turret camera shall provide enhanced night viewing through the increase of IR sensitivity by automatically switching a motorized IR filter from color to monochrome operation in low-light or IR illuminated applications. Allow the IR filter to be preprogrammed in a camera mode or profile.
- 14. The IP turret camera shall utilize pixel-by-pixel analysis to automatically compensate for bright areas of a high contrast scene (Back light) without having to define a window or area.
- e. Installation Requirements:
 - 1. Shall contain a full-featured camera and integral, fixed lens.
 - 2. Shall be capable of being mounted to a fence, surface, wall, corner or suspended ceiling.
 - 3. Shall provide power, video, and control via an Ethernet connection.
 - 4. Shall provide secondary power connection on a barrel connector.
 - 5. Shall provide a multi-language on-screen display
- f. IP Connectivity:
 - 1. The IP turret camera shall allow full camera control and configuration capabilities over the network.
 - 2. The IP turret camera shall offer Power over Ethernet (IEEE 802.3af).
 - 3. The IP turret camera shall be capable of capturing and storing images using H.265, Ultra H.265, H.264 and MJPEG encoding and compression at following resolution levels: 2592 x 1520 ~ 720 x 576.
 - 4. The IP turret camera shall deliver high quality, 2592 x 1520 resolution video at rates up to 20 images per second, via TCP/IP over Cat5/Cat6 UTP cable; and leverage bandwidth throttling and multicasting capabilities to manage bandwidth and storage requirements efficiently while delivering the best possible image quality and resolution.
 - 5. The IP turret camera shall generate independent H.265, Ultra H.265, H.264 or MJPEG streams simultaneously.
 - 6. The IP turret camera shall be ONVIF Profile S compliant.
- g. Sensor:
 - 1. Type: 1/3-inch CMOS
 - 2. Active Pixels: NTSC: 2592(H) x 1520(V)

h. IP Video:

- 1. Video Compression: H.265, Ultra H.265, H.264, MJPEG
- 2. H.264 Profile: Baseline, Main, High
- 3. Streaming: Multiple, individually configurable streams in H.265, Ultra H.265, H.264 or MJPEG, simultaneously
- 4. Frame rate per stream:
 - a. Main: 4MP (2592 x 1520) @ 20fps
 - b. Sub: 720P (1280 x 720) @ 20fps
 - c. Third Stream: D1 (720×576) @ 20fps
- i. Video:
 - 1. Shutter: 1 ~ 1/100,000 sec
 - 2. Min. Illumination: Color 0.03 Lux (F2.0, AGC On); B/W 0 Lux (with IR LED's On)
 - 3. TRUE Day / Night (ICR): IR-cut filter with auto switch
 - 4. Digital Wide Dynamic Range (D-WDR)
 - 5. Digital Noise Reduction: 2D & 3D-DNR
 - 6. Privacy Masking: up to 8 areas
 - 7. Motion Detection: up to 4 areas
 - 8. ROI: up to 8 areas
 - 9. OSD: up to 8 areas
 - 10. Privacy Masking: 8 windows
 - 11. Motion Detection: 8 windows
 - 12. Back Light Compensation
 - 13. Auto White Balance
- j. Software Control:
 - 1. Unit Configuration: Guard Tool Utility & Guard Station Software
 - 2. Software Update: Cloud Upgrade with connection to Uniview Tec NVR's
- k. Network:

- 1. Protocols: IPv4, IGMP, ICMP, ARP, TCP, UDP, DHCP, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, SSL
- 2. Security: Multi-user authority, HTTPS, IP Filtering, Privacy Zone
- 3. Ethernet: 10Base-T/100 Base-TX, RJ45
- 4. Power over Ethernet: IEEE 802.3af Class 0
- 1. Optical:
 - 1. Fixed focal length 2.8mm lens
 - 2. Iris Control: electronic auto-iris
 - 3. Angle of View (H x V): 104.4° x 54.4°
- m. Electrical:
 - 1. Input Power: 12VDC or Power over Ethernet (PoE), IEEE 802.3af
 - 2. Power Consumption (with IR LED On): PoE or 12VDC: maximum 4W
- n. Mechanical:
 - 1. Cast aluminum, weather resistant housing
 - 2. IR LED Light: 98ft (30M) maximum range indoor, under the best conditions
 - 3. Secondary Power Input: barrel connector
 - 4. Dimensions (Dia x H): 4.6 x 3.8in (118 x 96mm)
 - 5. Weight: 0.77lb (0.35kg)
 - 6. Operating Temperature: $-22^{\circ}F \sim 140^{\circ}F (-30^{\circ}C \sim 60^{\circ}C)$
 - 7. Operating Humidity: 10 to 95% RH (non-condensing)
- o. Conformity Certifications:
 - 1. Federal Communications Commission (FCC)
 - 2. European Conformity (CE)
 - 3. NEMA-4X (IP67)
- p. Accessories
 - 1. TR-WM03-B-IN: Wall Mount
 - 2. TR-UP06-IN: Pole Mount

3. TR-JB03-E-IN: Junction Box

2.03 <u>RECORDER</u>

- a. Technology: Digital IP
- b. No. IP Channels: 8-10
- c. HD/Megapixel Recording: Yes
- d. 3rd Party IP Devices: Supported
- e. Compression: H.264
- f. RAID Protection: None
- g. External Storage: Unsupported
- h. Included Storage: 2.0-3.8 TB
- i. Mac Compatible: Yes
- j. Serial Interface: RS-485
- k. Video Output: HDMI, VGA
- 1. Video Connection(s): RJ-45
- m. Audio Channels: 1
- n. Local Backup: External HDD
- o. Operating temperature: 41~104 °F (5~40 °C)
- p. Dimensions: 10.39 x 9.65 x 1.73 Inch (264 x 245 x 44 mm)
- q. Voltage: 48VDC
- r. Power Consumption: 90.24W Total Power Budget, 1.88A, 15.4W per PoE Channel
- s. Resolution: 1080P
- t. Features: Alarm Notification by E-mail, Audio, DDNS Functionality, H.264 Compression, HD Resolution, Supports PTZ Control
- u. Protocols: ACTi Protocols, Arecont Vision Protocols, Axis Protocols, Brickcom Protocols, Canon Protocols, Cellinx Protocols, D-Link Protocols, Dahua Protocols, Digital Watchdog Protocols, EtroVision Protocols, EverFocus Protocols, FLIR Protocols, HikVision Protocols, iCanTek Protocols, ONVIF Protocols, Panasonic protocols, Samsung protocols, Seyeon Tech Protocols, speco Protocols, UDP Protocols, Vision Hi-Tech Protocols, Vivotek Protocols.

- v. Harddrive Size: 2TB
- w. IP Channels: 9 Channels
- x. Supports PTZ Control
- y. H.264 Compression
- z. DDNS Functionality
- aa. Alarm Notification by E-mail
- bb. HD Resolution

PART 3 - EXECUTION

3.01 INSTALLATION

- a. Install devices in accordance with manufacturer's instruction at locations indicated on the drawings and as directed by the Engineer.
- b. Perform installation with qualified service personnel.
- c. Install devices in accordance with the National Electrical Code or applicable local codes.

3.02 FIELD QUALITY CONTROL

- a. Test snugness of mounting screws of all installed equipment.
- b. Test proper operation of all video system devices.
- c. Determine and report all problems to the manufacturer's customer service department.

3.03 <u>ADJUSTING</u>

a. Make proper adjustment to video system devices for correct operation in accordance with manufacturer's instructions.

3.04 DEMONSTRATION AND TRAINING

- a. Demonstrate at final inspection that video management system and devices, and recording equipment function properly.
- b. Demonstrate at final inspection camera's and recorder's functionality and video recording capabilities.

END OF SECTION

SECTION 15001 WATER MAINS

PART 1 - GENERAL

1.01 WORK INCLUDED

- a. Contractor shall furnish, lay and joint, test and disinfect water mains as shown on the Drawings and as required to fulfill the intent of the Specifications.
- b. The work shall include all excavation, backfill, backfill compaction, removal and disposal of excess excavated material to an off-site location, sheeting, bracing and dewatering required for all trenches.
- c. Contractor shall submit manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications and code requirements. Submit shop drawings for ductile iron pipe, types of joint, fittings, couplings, filling rings, lining and coating.
- d. The manufacturer shall submit a current certificate of compliance for the plant facility where the pipe is to be made. Certificate of compliance shall be submitted for each additional year of pipe manufacturing during the duration of the Project.
- e. Should additional restraint be required due to field adjustments in the horizontal and/or vertical alignment of the proposed water mains, restrained system of piping must be provided. Length of restraint to be determined by the Engineer.
- f. Contractor shall submit the name of competent person(s) responsible for the disinfection processes and performing the required bacteriological sampling. The Engineer will approve the disinfection process to be used in advance of any disinfection efforts.
- g. Contractor shall submit certificate of compliance that the independent commercial laboratory performing the bacteriological sampling analyses is certified with the Massachusetts Department of Environmental Protection and U.S. Environmental Protection Agency for analyzing public drinking water supplies.
- h. Contractor shall submit certified results for all bacteriological sampling prior to restoring or placing the distribution system into service.
- i. For each section of pipe to be chlorinated, the Contractor shall inform the Engineer in writing of the locations for taps to be installed and utilized for the procedure.

1.02 <u>SUBMITTALS</u>

a. Submit material specifications and shop drawings for all materials furnished under this section .

PART 2 - PRODUCTS

2.01 <u>DUCTILE IRON PIPE</u>

- a. Ductile iron pipe shall be centrifugally cast cement lined and shall conform with the ANSI A21.51 (AWWA C-151) Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids (latest revisions). Cement lining shall conform with AWWA C104 (ANSI A21.4-1985), Cement Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water, latest revision thereof, and shall include a bituminous seal coat. Pipe exterior shall receive a standard foundry coal tar dip coating in accordance with AWWA C151. Any defects found shall be repaired prior to shipment. Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work. The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification and that the material used was as specified. Pipe exterior shall receive a standard foundry bituminous coating. Pipe may be furnished in 18 or 20 foot nominal laying lengths. Pipe shall be American Cast Iron Pipe Company, Griffin Pipe Products, U.S. Pipe, or equal.
- b. Main line joints shall be of the push-on type with a rubber gasket conforming with ANSI A21.11 (AWWAC-111) (latest revisions). Pipe plain ends shall be suitable beveled to permit easy entry into the bell. Each joint shall be provided with two bronze wedges. Pipe joints shall be "Tyton" as manufactured by United States Pipe and Foundry Company. "Fastite" as manufactured by American Cast Iron Pipe Company, "Super Bell-Tite" as manufactured by Clow Cast Iron Pipe and Foundry Company, or equal.
- c. Flanged ductile iron pipe shall have ductile iron flanges conforming to ANSI B16.1 Class 125 specifications designed for use with ANSI/AWWA C110/A21.10-82 flanges fittings, with pipe barrel conforming to ANSI/AWWA C151/A21.51-81, or latest revisions with the previously mentioned exception. Ductile iron pipe shall be threaded and flanged in the foundry. The flanges shall be of the long hub type; screwed on the pipe barrel; power tightened by machine, and faced and drilled after tightening. No ductile iron pipe of class thickness less than Class 53, shall be threaded and flanged.
- d. Joint restraint shall be provided at all joints in the force main. On straight pipe lengths joint restraint shall be by the use of flanged joint retainer glands or by the use of joint restraint gaskets for push-on pipe joints, such as U.S. Pipe Field-Lok 350 Gaskets, or equal, or by the use of specially modified push-on pipe joints with joint restraint provided by ductile iron retainer rings jointed together by corrosion resistant, low alloy, high strength steel for head bolts and nuts.
- e. Pipe thickness design shall be in accordance with ANSI Standard A21.50-1976. <u>Thickness</u> <u>Design of Ductile Iron Pipe</u> (latest revisions) with design based upon maximum anticipated working pressure combined with a 50% increase for water hammer and utilizing the maximum anticipated earth loading conditions combined with an H-20 live loading. Minimum bedding conditions shall be Condition 2 as outlined in the above Standard. Minimum acceptable pipe thickness is Class 53.
- f. Push-on joints and mechanical joints shall conform to ANSI/AWWA C111/A21 11, latest revision. Bell and spigot joints shall be restrained. Only buried and non-exposed ductile iron pipe shall receive an outside bituminous coating.

- g. All fittings for ductile iron pipe shall be Class 250 ductile iron conforming to ANSI standards A21.10 and A21.11 for mechanical joint or push-on joint. The restraint of fittings shall be with thrust rods, concrete blocking or locktight gaskets as appropriate for the pressures anticipated, and as further direct in the field, considering particular conditions of installation.
- h. Cement lining shall conform to AWWA C104, latest revision (ANSI A21.4-1985) with bituminous seal coat. Cement lining shall be 1/8" thick for all pipes 12" diameter and smaller and 3/16" thick for all pipes 14" diameter and larger. The pipes shall be bituminous seal coated on the interior wall.
- i. Ceramic-lining shall conform to all applicable standards of the Ductile Iron Pipe Association and AWWA. All ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. The entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first six inches of the exterior of the spigot ends.
 - 1. Lining Material- CeramapureTM PL 90 Ceramic Epoxy or equal. The material shall be an amine cured epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining ductile iron pipe and fittings, a test report verifying the following properties, and a certification of the test results.
 - 2. Factory Tests-The following test must be run on coupons from factory lined ductile iron pipe:
 - a. Immersion testing rated using ASTM D-714
 - b. 20% Sulfuric Acid Immersion-- no effect after 5500 hours
 - c. 5% Sodium Chloride Solution (Salt Water) Immersion-Un-scribed panel-no effect after 2 years
 - d. 5% Sodium Chloride Solution (Salt Water) Immersion-Panel Scribed to Metal--no effect after 2 years
 - e. Distilled Water Immersion-- per AWWA C-550 passed
 - f. ASTM B-117 Salt Fog (Scribed Panel) Passed one year no undercutting. Undercutting Resistance: Alternate Wet/Dry Immersion(5% NaCl, flowing, aerated, 120 °F, Wet 1 hour followed by dry one hour- 12 Cycles daily)--Passed one year when rated using ASTM D-714--No undercutting at exposed edges.
 - g. Weathering--Coupons with cut edges Exposure exposed to ambient weathering conditions based upon manufacturer's recommendations for proposed location of installation passed one year- no undercutting at edges.
 - h. ASTM G-22 Standard practice for determining resistance of Synthetic Polymeric materials to bacteria. The test should determine the resistance to growth of Acidithiobacillus Bacteria and should be conducted at 30 degrees centigrade for a period of 7 days on a minimum of 4 panels. The growth must be limited only to trace amounts of bacteria.
 - i. An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598.

- j. ASTM G-95 Standard Test Method for "Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)". Resulting cathodic disbondment must average less than 2 mm and be qualified by independent lab testing.
- 3. Application The lining shall be applied by a certified firm and/or pipe foundry with a successful history of applying ceramic linings to the interior of ductile iron pipe and fittings. All applicators must be independently inspected at least two times per year to ensure compliance with the requirements of this specification. This inspection must be coordinated and reviewed by the manufacturer of the lining material and any deviation from the application and/or quality requirements shall be corrected by the applicator. All inspections shall be in writing and a permanent record maintained.
- 4. Surface Preparation Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance that can be removed by solvent, shall be solvent cleaned to remove those substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be reblasted.
- 5. Lining After surface preparation and within 12 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness of CeramapureTM PL90 or equal. No lining shall take place when the substrate or ambient temperature is below 40 ° F. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.
- 6. Coating of Bell Sockets and Spigot Ends Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using Ceramapure Joint Compound or equal. The compound shall be applied by brush to ensure coverage. Care should be taken that the compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.
- 7. Number of Coats The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining beyond the recoat limitations published by the lining manufacturer without roughening of the surface of the lining prior to recoating.
- 8. Touch-Up and Repair Manufacturer (CeramapureTM PL 90 or equal) repair kits shall be used for touch-up or repair in accordance with manufacturer's recommendations. Refer to manufacturer repair procedure.

- 9. Inspection All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC PA-2 Film Thickness Rating. The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired prior to shipment. Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.
- 10. Certification The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.
- 11. CeramapureTM PL90 or equal lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling. Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.
- j. Flanged ductile iron pipe shall have ductile iron flanges conforming to ANSI B16.1 Class 125 specifications designed for use with ANSI/AWWA C110/A21.10-82 flanged fittings, with pipe barrel conforming to ANSI/AWWA C151/A21.51-81, or latest revisions with the previously mentioned exception. Ductile iron pipe shall be threaded and flanged in the foundry. The flanges shall be of the long hub type; screwed on the pipe barrel; power tightened by machine; and faced and drilled after tightening. No ductile iron pipe of class thickness less than Class 53, shall be threaded and flanged.
- k. Split couplings shall be of the flexible, gasketed mechanical type. They shall be designed to mechanically engage and lock grooved or shouldered pipe ends, to form a positive couple allowing for some degree of angular deflection, contraction or expansion. Coupling shall have pressure ratings at least equal to the test pressures applied to the pipes being joined. Gaskets shall be of an elastomeric, synthetic rubber material and shall be of the type and composition recommended by the coupling manufacturer for the service and temperature intended.
- 1. Pipes designed to be jointed by split-type couplings shall have grooved or shouldered ends in accordance with the requirements of the coupling manufacturer. All pipe which is to be grooved shall have the minimum wall thickness recommended by the coupling manufacturer to ensure that the removal of the metal does not lessen the strength or pressure rating of the pipe. The Contractor shall note that if this wall thickness exceeds that which is otherwise specified in this section, the thicker wall pipe shall be furnished at no additional cost to the Owner.
- m. Minimum pipe wall thickness for grooved end pipe with split couplings shall be as follows:

Ductile Iron Pipe up to: 12" - Class 52 16" - Class 53

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WATER MAINS

- 18" Class 54 20" - Class 55 24" - Class 56 30" - Class 55
- 36" Class 55

PART 3 - EXECUTION

3.01 LAYING AND JOINTING

- a. All pipe shall be carefully examined for defects, and no pipe known to be defective shall be laid. Any defective pipe discovered after laying shall be removed and replaced in a satisfactory manner, regardless of any prior approvals.
- b. Keep trenches dewatered while installing pipe until all required pipe joints have been made and the trench has been backfilled above the water table to a point where pipe uplift will not occur when the pipe is empty.
- c. All pipe and castings shall be thoroughly cleaned before being lowered into the trench, or before jointing. The exposed ends of all incomplete lines shall be closed with tight plugs adequately secured at all times when pipe laying is not actually in progress.
- d. All pipe castings shall accurately conform to the lines and grades shown on the plans or ordered by the Engineer. All wall pipes and other castings to be imbedded in concrete shall be accurately set and thoroughly secured. Pipe shall be laid in a manner to assure that valve stems and boxes will be set plumb.
- e. Install pipe with a minimum of 5.5 feet of cover, unless indicated otherwise on the Drawings or directed by the Engineer.
- f. Install underground warning tape over the pipe
- g. Special care shall be exercised at the outside face of structures and manholes to support pipes bridging the excavation for such structures or manholes. The pipe shall be supported by compacted gravel bedding or 1500 psi concrete as directed by the Engineer. The cost for these supports shall be deemed included in the price bid for the work.
- h. Where required for proper location of laterals, valves, fittings, or other castings; or for any other purposes; or where ordered, pipe or fitting shall be cut with an approved pipecutter. Cutting shall be carefully done by experienced persons, in such a manner as to leave a smooth end normal to the axis of the pipe.
- i. Where shown on the Drawings, or required in the finished work, all pipe and special castings shall be adequately supported, anchored and secured by approved encasements, hangers or ties.
- j. Sleeves and mechanical couplings shall be provided when necessary to provide adequate flexibility, not only for convenience in the original installation of the line, but to afford convenience in the event of future removal, alterations or repairs.

- k. Location of joints shall be such as to provide maximum convenience in assembly of piping and appurtenant equipment, with provisions by sleeves or couplings to minimize strain on structures, equipment or flanges.
- 1. Any cracked or broken pipe or valves shall be promptly removed and replaced with sound pieces regardless of any prior approval.
- m. All flanges, unless otherwise required, shall have standard drillings. Flanges shall be firmly bolted with machine, stud or tap bolts of the proper size and thread. The bolts and nuts shall be of the best quality refined bar steel, with good, true threads, and shall be so tightened as to evenly distribute the stress in the bolts and bring the pipe into uniform alignment.
- n. In general, no flanges shall be permitted underground except where directed by the Engineer.
- o. Bolts shall have standard hexagonal heads and nuts made to American Standard rough dimensions, and shall be conferred and trimmed. All bolts shall be Stainless Steel 316.
- p. Where required, flanges shall be tapped for stud bolts.
- q. All gaskets shall be Rainbow, Durable, Garlock, or equal, unless lead or other material is specifically called for.
- r. Gaskets 8" in diameter and smaller shall be 1/16" thick and gaskets larger than 8" in diameter shall be 3/32" thick.
- s. Mechanical joints shall be made in strict accordance with the manufacturer's recommendations, using proper bolt torques and gaskets lubricants. All parts shall be thoroughly cleaned before assembly.
- t. Where shown on the Drawings, or where in the opinion of the Engineer, convenience of installation or removal, or particular flexibility to avoid breakage in service, is required, flexible couplings of the Dresser or Victaulic type shall be furnished and installed.
- u. Jointing with mechanical couplings shall conform with instructions of the manufacturer. All bolts shall be tightened to preserve true alignment and uniformly distribute the stress in the bolts. Bolt tightening shall be accomplished with torque wrenches.
- v. Bell and spigot rubber ring joints shall be assembled in strict accordance with the manufacturer's recommendations. Bell and spigot shall be thoroughly cleaned before making up the joints.
- w. When ductile iron pipe is cut in the field, cut ends shall be tapered about 1/8" at a 45° angle and all sharp edges or rough spots removed by use of a coarse file or portable grinder.
- x. Threaded joint piping shall be made up with lubricants applied on the male threads only. No undue strains shall be placed on threaded joints due to misalignment of pipe. Lampwick, cord, fibre, lead wool or other unapproved material is prohibited for making up threaded joints.
- y. Welded joints shall be made using pipe and fittings bevelled for V welds with all workmanship in accordance with the ANSI "Code of Pressure Piping".

- z. All welds shall be made by certified welders and shall conform to procedures for which each welder has been certified. The Contractor shall submit certification statements for the welders and the methods employed.
- aa. All pipe of Schedule 10 and heavier wall thickness shall be properly prepared before butt welding. Grind ends to a 37 1/2° bevel, leaving a flat lip of approximately 1/16" on inside edges. Clean ends with acetone or denatured alcohol and a stainless steel wire brush. Weld preparation procedures other than as specified herein shall be as approved by the Engineer.
- bb. All welds shall have full penetration and be smooth without protrusions on the interior of the pipe. Any cracks or blow holes appearing on the surface of a welding bead shall be ground away before depositing the next bead.
- cc. Solder joints shall be made using recessed fittings and 95-5 solder alloy. Joints shall be completely filled.

3.02 HYDROSTATIC PRESSURE TEST

- a. When a reach of pipe deemed adequate by the Engineer is ready for testing, the line shall be completely filled with water, all air expelled, and a pressure and leakage test made. Contractor shall be responsible for expelling all air from high points in the lines by installing corporations. Location of the corporations shall be as directed by the Engineer. Piping shall be tested prior to connection with the existing system unless otherwise approved by the Engineer. The Contractor shall furnish all labor, materials and equipment for performing these tests in the presence of the Engineer, including calibrated pressure gauges, test bulkheads, filling, draining, and air release connections and valves, calibrated drum and test pump.
- b. Unless otherwise required to meet working conditions, all new water pipelines shall be tested under a hydrostatic pressure of 150 pounds per square inch on the lowest part of the section under test. The duration of each pressure test shall be at least two hours. Each pressure test shall be conducted in accordance with ANSI/AWWA C600, latest revision, "Installation of Ductile Iron Mains and Their Appurtenances".
- c. All tests must be conducted in the presence of the Owner's representative. Any tests not witnessed by the Owner's representative shall be void and the Contractor shall be required to re-test that particular section in the presence of the Owner's representative at the Contractor's own expense.
- d. Under the foregoing conditions, the allowable leakage shall be determined by the following formula:

$$L = \frac{(S) (D) (\sqrt{P})}{148,000}$$

- L = Allowable Leakage, Gallons per hour
- S = Length of Pipe Tested, feet
- D = Nominal Pipe Diameter, inches

P = Average Test Pressure, psig

- e. Joints that leak shall be repaired and retested under the same conditions and under the same period of operation. If joints are found to be defective, they shall be replaced until the line passed the required test at the Contractor's expense.
- f. All valves, plugs, fittings and appurtenances necessary to complete testing shall be included within the various unit prices bid throughout the Contract.

3.03 DISINFECTION TEST OF WATER MAINS

- a. All piping shall be thoroughly cleaned, flushed and sterilized in accordance with ANSI/AWWA C651, latest revision, Disinfecting Water Mains. Following chlorination and after the entire length of line is ready for service, all chlorinated water shall be flushed thoroughly from the newly laid pipeline at its extremities until the replacement water throughout its length shall equal in quality, both chemically and bacteriologically, the water at source. All chlorinated water shall be dechlorinated or properly disposed of as approved by the Town.
- b. All work of flushing and sterilizing shall be the responsibility of the Contractor. Bacteriological samples shall be taken 24 hours and 48 hours (two consecutive days) following completion of sterilization and flushing at each hydrant location and analyzed for the absence of total coliform, standard plate count, and chlorine residual and reported upon by a State certified testing laboratory.
- c. Two consecutive sets of acceptable samples, taken at least 24-Hours apart are required prior to placing the main into service. Failure of any one of the bacteriological test samples shall require rechlorination and retesting by the Contractor.
- d. The main shall be flushed to the lowest hydrant and shall undergo visual verification for lack of solids or discoloration. Should the flushed water be discolored then flushing shall persist until the water achieves clarity and aesthetic quality for safe consumption. No newly laid water main may be placed into service until approval is given by the Engineer and Owner.
- e. After the applicable retention period, heavily chlorinated water should not remain in contact with pipe for more than 48 hours. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use. Contractor shall arrange for disposal of the heavily chlorinated water.
- f. The chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed in Table 1.
- g. The proposed disposal site to which the chlorinated water is to be discharged shall be inspected and approved by the Engineer. A reducing agent shall be applied to the chlorinated water to be wasted to completely neutralize the chlorine residual remaining in the water. (See Table 1 for neutralizing chemicals). Where necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Residual Chlorine Concentration (mg/l)	Sulfur Dioxide (SO ₂)	Sodium Bisulfite (NaHSO3)	Sodium Sulfite (NaSO3)	Sodium Thiosulfate (Na2S2O35H2O)
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

 Table 1

 Pounds of chemicals required to neutralize various residual chlorine concentrations in 100,000 gallons of water

END OF SECTION

SECTION 15060 HANGER AND SUPPORTS

PART 1: GENERAL

1.01 SCOPE OF WORK

- a. Contractor shall provide all supporting devices and appurtenances shown, specified or required for pipes, fittings, valves and other in-line equipment.
- b. Included in this classification are pipe pole supports and saddle stands; concrete anchor blocks and bases, and all necessary guides, restraints, fastening devices, anchor bolts, pipe anchors and appurtenances.
- c. Contractor shall provide all temporary pipe supports required during construction.
- d. Contractor shall design all piping support systems in accordance with the requirements of this Specification unless otherwise shown or specified.
- e. Pipe supports shall be designed and signed by a MA PE.

1.02 <u>RELATED WORK</u>

- a. Specification 03400 Precast Concrete
- b. Specification 05500 Metal Fabrications

1.03 <u>REFERENCES</u>

- a. The Manufacturers Standardization Society of the Valve and Fitting Industry:
 - 1. MSS SP-58- Pipe Hangers and Supports Materials, Design and Manufacture.
 - 2. MSS SP-69-Pipe Hangers and Supports Selection and Application.
 - 3. MSS SP-89-Pipe Hangers and Supports Fabrication and Installation Practices.
 - 4. MSS SP-90-Guidelines on Terminology for Pipe Hangers and Supports.
- b. Federal Specification, FS W-H-171 Hangers and Support, Pipe.
- c. Underwriter's Laboratories, Inc., Standard UL-203 Pipe Hanger Equipment.
- d. ASTM A 36-Standard Specification for Carbon Structural Steel.
- e. ASTM A 48-Standard Specification for Gray Iron Castings.

- f. ASTM A 276-Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
- g. ASTM A283-Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
- h. ASTM A778-Standard Specification for Welded, Unannealed Austenitic Stainless-Steel Tubular Products.
- i. ASME B31.1-Power Piping.
- j. IBC-International Building Code, Latest Edition. Section 1621
- k. EJMA-Expansion Joint Manufacturers Association.
- 1. NFPA 13-Installation of Sprinkler Systems.
- m. ASCE 7, latest edition -Section 9.6.

1.04 **DESIGN REQUIREMENTS**

- a. Contractor shall provide supports of sufficient strength to maintain the pipelines and appurtenances in proper position and alignment under all operating conditions.
- b. All hangers and supports shall conform to the applicable requirements of ASME B31.1, MSS SP-58, SP-59, SP-69 and SP-90, except as modified herein, and be of standard manufacture wherever possible, and best suited for the service required.
- c. Unless otherwise approved, all supports and concrete inserts shall be listed with Underwriters' Laboratory, Inc.
- d. General Requirements:
 - 1. Pipe and appurtenances connected to equipment shall be supported in a manner to prevent any stress being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, certification shall be submitted stating that requirements have been complied with.
 - 2. A minimum clearance of one inch shall be provided between pipe and other work.
 - 3. Supports shall be capable of adjustment after placement of piping.
 - 4. Types of supports shall be kept to a minimum.
 - 5. Vertical piping shall be supported by stays or braces to prevent rattling and vibration.
 - 6. Contact between dissimilar metals shall be prevented by use of copper plated, rubber or vinyl coated supports.

- 7. Supports shall provide for expansion and contraction throughout the full operating temperature range.
- 8. Any required pipe supports, for which the supports called for in this Specification are not applicable, shall be fabricated or constructed from standard stainless steel shapes, concrete and anchor hardware, and shall be subject to the approval of Engineer.

1.05 <u>SUBMITTALS</u>

a. Contractor shall provide detailed drawings of each pipe support. Each drawing shall contain enough information to verify the pipe support design and to allow the manufacture of the device.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- a. Pipe supports and appurtenances shall be standard products of the manufacturers listed in the Specifications.
- b. Each type of support shall be the product of a single manufacturer.

2.02 <u>MATERIALS</u>

- a. Materials for supports of metallic construction shall conform to ASME B31.1 and to the following standards:
 - 1. Structural Steel, ASTM A 36 and A 283.
 - 2. Iron Castings, ASTM A 48 (Class No. 35).
 - 3. Stainless Steel, ASTM A 276
 - a. Type 316 stainless steel for non-welded items.
 - b. Type 316L stainless steel for welded or fabricated items.
 - c. Tensile Strength 70,000 psi minimum.
 - d. Yield Strength 25,000 psi minimum.
 - e. Elongation in 2 inches 35%.
 - f. Reduction of area 45%.
 - 4. Stainless Steel Pipe and Tube, ASTM A 778, Type 316L stainless steel.
- b. Pipe supports, brackets, guides, restraints, rods, bolts, nuts and anchors shall be Type 316 stainless steel. Concrete inserts shall be of malleable iron with galvanized finish.

- c. Only new materials shall be provided.
- d. Supports shall conform to MSS-SP-58, Table 2.
- e. Proprietary fiberglass reinforced plastic supports for use with small diameter chemical and thermoplastic pipe shall be as specified in the Specifications and approved by the Engineer.
- f. Expansion anchors for use in existing concrete structure shall be made of Type 316 stainless steel.

2.03 <u>SUPPORTS</u>

- a. Supports where shown shall be in accordance with the Drawings. Supports not shown shall comply with MSS SP-58.
- b. All supports shall allow minimum 3-inches of vertical adjustment.
- c. Supports shall be of the following types:
 - 1. Supports for Single Pipe:
 - a. Single pipes located in a horizontal plane close to the floor shall be supported with a saddle type pipe support as shown on the Drawings.
 - b. Stanchions and saddle stands shall be of Type 316L stainless steel.
 - 2. Wall Supported Pipes: Single or multiple pipes located adjacent to walls, columns or other structural members, and an excessive distance from ceilings or underside of beams, shall be supported using stainless steel wall brackets, MSS SP-58 Type 32 or 33. Where pipes rest on top of bracket pipe supports, attachments shall meet the requirements specified under Paragraph 2.b above.
 - 3. Supports for Base Elbows: Where pipes change direction from horizontal to vertical through a bend, a base elbow pipe support shall be provided, as shown on the Drawings, at the bend to carry the load.
 - 4. Supports for Thermoplastic Pipes: All thermoplastic pipe attachments shall have a continuous bearing cradle or saddle on the lower 120 degrees of pipe circumference and a minimum length of one quarter pipe diameter, but not less than 6 inches nor more than 12 inches.
 - 5. Concrete Supports:
 - a. Where pipeline or mechanical equipment is shown, specified or required to be supported on concrete supports, supports shall be as specified herein.
 - b. Concrete supports for equipment shall be of a size and mass that will resist all forces, both static and dynamic, which may be developed by the equipment.

- c. Concrete supports for pipe, fittings, valves and appurtenances shall be designed to carry the weight of the pipeline and appurtenances. Cradles and anchor blocks shall safely withstand all stresses imposed by the pipelines, under all operating conditions. Concrete cradles shall be shaped to fit the contour of the pipe.
- d. Concrete supports shall be anchored to the floor of main structures by doweling or other approved means. Anchor bolts, extension plates, saddle yokes and other hold-down devices in concrete bases shall be placed before pouring of concrete. Expansion bolts shall not be used on new concrete supports except with the specific approval of the Engineer.
- e. Concrete supports shall be in accordance with Section 03005, Structural Concrete.

2.04 <u>PIPE INSULATION PROTECTION</u>

- a. Contractor shall furnish steel protection saddles on all supports for insulated pipe.
- 1. For pipe sizes less than 12 inches in diameter, provide saddles of No. 14 U.S. gauge stainless steel curved 180 degrees for use with roller hangers or structural trapeze hangers and of No. 16 U.S. gauge stainless steel curved 120 degrees for use in clevis hangers. Saddles shall be at least 12-inches long. Saddle gripping side edges shall be turned up at least to the thickness of insulation.
- 2. For pipe 12 inches in diameter and larger, provide saddles of No. 12 U.S. gauge stainless steel with a welded centerplate to provide three-edge support. Saddles shall be at least as long as the pipe diameter, provide 120 degree coverage and have edge and centerplate depths equal to the insulation thickness.

2.05 <u>SADDLES</u>

- a. Before placing the saddles, saddles shall be filled with either insulating cement or high density insulation cut to fit. For vapor barrier insulation, the barrier must be maintained; contact between hanger and support and bare pipe will not be permitted.
- b. Anchors and sway braces shall be provided when required to hold the pipelines and equipment in position or alignment. Pipe anchors and braces for rigid fastening to the structures shall be attached to stainless steel anchor plates and anchor bolts set into the forms when placing concrete of new structures. Brackets and braces shall be attached to existing concrete structures with through bolts or expansion anchors.
- c. Anchors, guides and restraints shall be provided for the proper operation of pipeline expansion joints.
- d. Cast iron anchors shall be provided with stainless steel straps on piping, except where anchors form an integral part of pipe fittings and couplings or where an anchor of special design is required or shown on the Contract Drawings.
- e. All pipe anchors, guides and restraints shall be designed to conform to ASME B31.1.

2.06 <u>INSPECTION</u>

a. The Owner may elect to conduct shop inspections. The inspections may include but not be limited to: mechanical and chemical testing, material sampling, material certifications, traceability of parts, blasting and painting, visual and dimensional inspection, and free iron contamination check on stainless steel parts.

PART 3 EXECUTION

3.01 <u>GENERAL</u>

- a. Supports, and accessories shall be located within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.
- b. Supports shall be provided at all locations where piping changes direction.
- c. Supports shall be located to prevent vibration or swaying and to provide for expansion and contraction.
- d. Concrete embedded items shall be installed before concrete placement.
- e. Embedded items shall be fastened securely to prevent movement during concrete placement.
- f. Support units installation methods shall be in accordance with manufacturer's recommendations.
- g. Supports shall be adjusted and grout placed to bring pipelines to specified elevations.

3.02 <u>SUPPORTS INSTALLATION</u>

- a. Supports for Horizontal Pipes:
 - 1. Supports for all piping shall be placed no farther apart than the table shown below, unless otherwise shown or specified. Tables are based on MSS SP-69 Tables 3 & 4. Spacing and capacities are based on water filled pipe plus 50 lbs. /ft. dead load. Closer spacing may be required where additional valves and fittings increase the load.

RECOMMENDED SPACING AND ROD SIZE FOR STEEL PIPE				
Nominal Pipe Size	Maximum Span*	Recommended Hanger Rod Sizes	Recommended Hanger Rod Sizes (double rod –	Maximum Load Per Hanger
(inches)	(feet)	(single rod – inches)	inches)	(lbs.)
3/4"	7	3/8"	3/8"	300
1"	7	3/8"	3/8"	300
1 1/4"	7	3/8"	3/8"	300

RECOMMENDED SPACING AND ROD SIZE FOR STEEL PIPE				
Nominal Pipe Size (inches)	Maximum Span* (feet)	Recommended Hanger Rod Sizes (single rod – inches)	Recommended Hanger Rod Sizes (double rod – inches)	Maximum Load Per Hanger (lbs.)
1 1/2"	9	3/8"	3/8"	300
2"	10	3/8"	3/8"	325
2 1/2"	11	1/2"	3/8"	350
3"	12	1/2"	3/8"	400
3 1/2"	13	1/2"	3/8"	450
4"	14	5/8"	1/2"	850
5"	16	5/8"	1/2"	950
6"	17	3/4"	5/8"	1075
8"	19	7/8"	5/8"	1350
10"	22	7/8"	5/8"	1750
12"	23	7/8"	3/4"	2200
14"	25	1"	7/8"	2500
16"	27	1"	7/8"	3075
18"	28	1"	7/8"	3700
20"	30	1 1/4"	1"	4425
24"	32	1 1/4"	1"	6050

*For spacing greater than 10'-0", many codes require spacing a maximum of every 10' regardless of size. Contractor shall check with local codes and comply as applicable.

RECOMMENDED SPACING AND ROD SIZE FOR COPPER TUBING			
Nominal Tubing Size (inches)	Maximum Span* (Feet)	Recommended Hanger Rod Sizes (inches)	
1/2"	5	3/8"	
3/4"	5	3/8"	

RECOMMENDED SPACING AND ROD SIZE FOR COPPER TUBING			
Nominal Tubing Size (inches)	Maximum Span* (Feet)	Recommended Hanger Rod Sizes (inches)	
1"	6	3/8"	
1 1/4"	7	3/8"	
1 1/2"	8	3/8"	
2"	8	3/8"	
2 1/2"	9	1/2"	
3"	10	1/2"	
3 1/2"	11	1/2"	
4"	12	1/2"	
5"	13	1/2"	
6"	14	5/8"	
8"	16	3/4"	

*For spacing greater than 10'-0", many codes require spacing a maximum of every 10' (3.048 meters) regardless of size. Contractor shall check with local codes and comply as applicable.

- 2. Additional spacing requirements:
 - a. Ductile Iron, Steel and Stainless Steel Pipe:
 - 1) Maximum spacing in accordance with Table 3 of MSS-SP-69. The designer should check the capacity of the steel or building structure to which the hanger or support is attached, and adjust the maximum spacing accordingly.
 - 2) In addition, ductile iron pipe shall have a minimum of two supports per length and shall have a support adjacent to each end.
 - b. Thermoplastic Pipe:
 - 1) Pipes up to 1-inch: 2 feet-6 inches center to center.
 - 2) Pipes 1-1/2-inch to 3-inch: 4 feet-0 inches center to center.
 - 3) Pipe 4-inch to 8-inch: 6 feet-0 inches center to center.

- 4) Pipes larger than 8-inch: 8 feet-0 inches center to center.
- c. Cast Iron Soil Pipe: 5 feet-0 inches.
- d. Tubing less than 1-inch diameter: In accordance with best piping practice and ASME B31.1, and as approved by the Engineer.
- 3. Additional supports shall be placed immediately adjacent to any change in piping direction, at equipment, and on both sides of valves, expansion joints and couplings.

3.03 PAINTING AND COATING

a. Surfaces of supports in contact with aluminium, brass, plastic and copper pipelines or pipeline equipment shall be protected with an approved plastic coating to prevent abrasion. Touch-up shall be provided in the field, as required. Coating shall be applied in accordance with the manufacturer's recommendations, and shall be free from spots and brush marks, to the satisfaction of the Engineer.

3.04 <u>TESTING</u>

- a. All pipe support and restraining systems shall be installed and secured prior to the testing or activation of the pipeline on which they are installed.
- b. All pipe support systems shall be tested for compliance with the Specifications. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests. Tests shall include cycling the piping system to duplicate operating conditions. If any part of the pipe support system proves to be defective or inadequate, as evidenced by vibration or excessive movement, it shall be repaired or augmented at no additional cost to the owner.

END OF SECTION

SECTION 15070 POLYVINYL CHLORIDE PIPE

PART 1 - <u>GENERAL</u>

1.01 <u>SCOPE OF WORK</u>

- a. The Contractor shall furnish, lay, joint, adjust, and test Polyvinyl Chloride (PVC) gravity sewer pipe and fittings, and low-pressure force mains and fittings, as described herein, shown or specified on the Drawings, and as required to fulfill the intent of the Contract Documents.
- b. The work shall include all labor, tools, materials, and equipment including couplings and jointing materials.

1.02 <u>RELATED WORK</u>

a. Section 15990 – Leakage and Testing

1.03 <u>REFERENCES</u>

- a. ASTM latest edition, as follows:
 - 1. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
 - 2. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - 3. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - 4. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
 - 5. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 - 6. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

1.04 <u>SUBMITTALS</u>

- a. Shop Drawings:
 - 1. A complete schedule of pipe, fittings, and specials with mark numbers on the schedule and on drawings corresponding to the mark numbers which will be on the pipe, fittings, and specials when delivered to the job site.
 - 2. Material lists which include and describe all materials to be utilized.
 - 3. Shop drawings showing the details and joint dimensions for the pipe, fittings, joints, joint gaskets, lubricants, and specials to be supplied for this project.
 - 4. Joint and pipe/fitting wall construction details which indicate the type and thickness of the pipe wall; manufacturing tolerances; and all other pertinent information required for the manufacture of the product.
 - 5. Material lists that include and describe all materials to be utilized.
 - 6. Testing plan.
- b. Certifications

1. Provide a Certificate of Compliance of pipe with applicable ASTM Standards listed above.

c. Verification

1. Inspections: All pipe and fittings will be subject to inspection and approval by the Engineer after delivery to the site. Do not use broken, cracked, ultraviolet radiation damaged, misshaped, imperfectly coated, damaged or otherwise unsatisfactory pipe or fittings. Such inspection by the Engineer shall not relieve the Contractor of full responsibility for the material installed. Gaskets shall be stored in a cool and dry location, out of direct sunlight and not in contact with any products that will result in damage to the gaskets.

1.05 **QUALIFICATIONS**

- a. All PVC pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the products to be furnished. Certifications of compliance listed in Paragraph 1.1.04.B shall be furnished. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- b. Pipe shall be the product of one manufacturer and of the sizes indicated.

1.06 MATERIAL REQUIREMENTS

a. All material furnished under this Section is subject to inspection by the Owner or Engineer at the manufacturing facility in accordance with these Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- a. Pipe
 - 1. All pipe shall be best quality unplasticized polyvinyl chloride (PVC) sewer pipe, adequate for the external loading conditions shown on the Drawings, with joints providing flexibility and watertightness under service conditions. Smooth internal surfaces, producing high carrying capacity obtainable with best standard practice and best workmanship, will be required.
 - 2. PVC pipe shall be of the size indicated on the Drawings or as specified and shall conform to the latest revision of ASTM D3034, Type C900, SDR-21, SDR-26, and SDR-35, as applicable. Standard laying lengths shall not exceed 14.0 feet.
 - 3. The pipe shall be accurate and of uniform dimensions. All pipe shall be straight and true to form without bulges, dents, cracks, tears, or other defects which will affect strength, and shall have no bulges or dents on interior surfaces which will result in a noticeable variation in diameter from that obtained on adjacent unaffected portions of the surface. Each pipe shall not vary in length more than 1.0 inch in a length of 12-1/2 feet measured as mid-ordinate. Materials properties shall meet the test requirements of ASTM D1784 (latest revisions).

- 4. Shop drawings shall be submitted for the Engineer's review prior to ordering any materials under this item.
- 5. Pipe shall be manufactured by National Pipe & Plastics, Inc. or JM Eagle, or Equal.
- b. Joints
 - 1. Joints shall be of the bell and spigot type with rubber ring. The pipe shall utilize a "lock-in" integral gasket joint (also known as a Rieber gasket) and shall be manufactured in accordance with ASTM D3212, latest revision. The bell shall consist of an integral wall section with a solid cross-section rubber ring factory assembled. The ring groove shall be so designed as to prevent ring displacement. The joint gaskets shall be reinforced with a steel ring band that permanently locks the gasket in place. The joint seals shall be an elastomeric type as specified herein and shall meet the requirements of ASTM F-477.
 - 2. Unless otherwise specified, gaskets shall be Buna-N (Nitrile). Size shall be as shown on the Drawings or as required by field conditions. Jointing shall be in accordance with recommendations of the manufacturer.
- c. Marking Pipe
 - 1. Pipe class, size, and material
 - 2. Date of Manufacture
 - 3. Manufacturer's name or trademark
 - 4. Manufacturer's identification number
- d. Pipe shall be colored green for in-ground identification as sewer pipe.

2.02 <u>PVC PIPE FITTINGS</u>

- a. PVC pipe fittings shall be constructed of a PVC compound meeting the requirements of cell class 12454-B as defined by ASTM D-1784. Pipe fittings shall meet the requirements of in ASTM D3034.
- b. PVC pipe fittings shall be furnished with wall thickness corresponding to dimension ratio of the corresponding pipe (i.e. provide SDR-26 PVC fittings for SDR-26 PVC piping). The pipe stiffness shall be in accordance with ASTM designation D-2412 for External Loading Properties of Plastic Pipe by Parallel Plate Loading, with a minimum "stiffness factor" (F/y) = 115 psi (PS115).
- c. The PVC pipe fitting joint design shall meet watertight performance requirements of ASTM D-3212. The joint gaskets shall be reinforced with a steel ring band that permanently locks the gasket in place. Material used for elastomeric seals in push-on joints shall meet the requirements of ASTM Specification F-477.

PART 3 - EXECUTION

3.01 <u>GENERAL</u>

a. All pipe shall be carefully examined for dents, excessive deflection, or bowing, and other defects.

- b. No pipe known to be defective shall be laid. If any pipe is found to be broken or defective after being laid, it shall be removed and replaced by sound pipe without any further payment than is included in the prices bid.
- c. Joint surfaces shall be protected from damage and shall be carefully examined before jointing. No damaged joints shall be used in the work.
- d. Pipe shall be thoroughly cleaned and ample precautions shall be taken to prevent entrance of dirt and debris into the pipe after laying. Exposed ends of the sewer shall be provided with temporary plugs or covers.
- e. All pipe shall be carefully laid to true alignment and grade and installed in accordance with ASTM D2321, latest revision.
- f. The pipe shall be carefully graded to the proper elevation, and the maximum practical solid bearing area shall be provided throughout its entire length, prior to swinging the pipe into place. Requirements for proper bedding shall also include adherence to typical bedding details as shown on the Drawings.
- g. No wedging or blocking is permitted in laying pipe unless by written order of the Engineer.
- h. All pipe shall be accurately centered prior to jointing and then thoroughly driven home. All trenches shall be dewatered prior to laying pipe. Dewatering methods shall be included under the price bid for carrier pipe installation.

3.02 JOINTING

- a. Pipe shall be carefully jointed in conformity with the best practice and the detailed instructions of the manufacturers. All pipe ends shall be thoroughly cleaned prior to and during the jointing operation. The pipe end shall be thoroughly lubricated in accordance with the recommendations of the manufacturer.
- b. Actual details of required jointing practice will depend upon the particular type adopted, but shall in all cases, involve approved practice and shall be such as to produce the required results, particularly with regard to water tightness.

3.03 LAMPING

- a. Contractor shall provide access for the Engineer to lamp all installed pipe between manholes. Sewer lines shall meet the following standards to pass the lamping inspection.
 - 1. Barrel of pipe shall have no vertical deflection and at least eighty percent of barrel shall be visible in the horizontal direction.

3.04 <u>TESTING</u>

a. Refer to Section 15990 for pipe testing requirements.

END OF SECTION

SECTION 15080 SERVICE LATERALS AND CLEANOUTS

PART 1: <u>GENERAL</u>

1.01 <u>SCOPE</u>

- a. Whenever directed by the Engineer, the Contractor shall install service laterals from the main line sewer to the property line as detailed on the Drawings including cleanout riser pipe, pipe and fittings, dewatering, excavation, backfill and stone bedding or as may be specifically ordered by the Engineer and at locations ordered by the Engineer.
- b. An approved wye or tee-wye connection fitting shall be installed in the collection main in accordance with the instructions of the pipe manufacturer. The entire connection shall be supported by stone as detailed on the Contract Documents.

1.02 <u>SUBMITTALS</u>

a. Submit material specifications and shop drawings for all materials furnished under this section.

PART 2: <u>PRODUCTS</u>

2.01 <u>MATERIALS</u>

- a. Service laterals which connect to PVC gravity sewer piping shall be in accordance with ASTM D3034-85b, and shall be 6-inch diameter SDR-35 PVC pipe. Fittings for SDR-35 PVC laterals shall be PVC sewer pipe fittings with a rubber ring in each bell and ring groove so designed as to prevent ring displacement.
- b. Service laterals which connect to PVC low-pressure force mains shall be in accordance with ASTM D2241, and shall be 1-1/2-inch diameter SDR-21 PVC pipe. Fittings for SDR-21 PVC low-pressure force main laterals shall be PVC sewer pipe fittings with a rubber ring in each bell and ring groove so designed as to prevent ring displacement. A Fernco adapter or equal shall be used for connection to existing piping only on the customer end of the service lateral.
- c. Cleanout boxes shall be provided as indicated on the Drawings or where ordered by the Engineer and are primarily to be used where a cleanout may be located in driveways or parking area. Cleanout boxes located in traffic areas shall be fitted with a cover and riser bearing the word "SEWER".

PART 3: <u>EXECUTION</u>

3.01 WORKMANSHIP

a. Service connections in any given street shall be laid coincidentally with or shortly after main sewer is installed so that street repairs and cleanup are rapidly completed. All connections shall be supported to firm undisturbed ground with 3/4-inch clean broken stone as directed

507408636-002 February 2020 by the Engineer. Stone is to be furnished and installed as specified in Section 02315, Trenching, Backfilling, and Compacting.

- b. The pipe shall be laid on a continuous upgrade of 1/4" per foot and located where ordered by the Engineer.
- c. No service trench shall be backfilled before inspection by the Owner or Engineer.

3.02 SERVICE RECONNECTIONS

- a. Contractors is responsible for coordination with the Owner, Engineer, and residents/property owners as required for the completion of service connections.
- b. Reconnect service connections to the new sewer main only after the sewer main has been satisfactorily tested and the Engineer has informed the Contractor that the system is ready for operation.
- c. Provide written notification to each property owner at least 24 hours prior to the reconnection of the house service so that the owner may make arrangements to suspend use of the service during reconnection.
- d. Complete service reconnection work for each house on the same day it is started.

END OF SECTION

SECTION 15100 VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 WORK INCLUDED

a. The Contractor shall furnish, install, paint, adjust, and test all valves shown on the Drawings or required to provide a complete installation which is ready to operate. Valves shall be installed complete with all necessary appurtenances including hangers and supports, extension stems, floorstands, hand and chain wheels, operating wrenches, indicators or special automatic operators.

1.02 MATERIALS AND WORKMANSHIP

- a. Gate valves shall conform with all applicable provisions of AWWA Standard Specification C500, or C-509, latest edition. Plug valves and knife valves shall be the best of their respective types and shall conform to the criteria listed in these Specifications.
- b. Gate valves and check valves shall be of the same manufacturer, as far as practical.
- c. All valves of a particular type shall be of the same manufacturer.
- d. Valve flanges shall be ANSI 125 lb. Bells for underground valves shall match adjoining piping. No knife valve may be used for underground installation.
- e. Unless otherwise required, all valves three (3") inches and larger and located in structures shall have flanged ends. Valves smaller than three (3") inches shall have threaded ends. Buried valves shall have standard two (2") inch operating nuts and shall have mechanical joint ends to conform to connecting piping.
- f. Extension stems shall be provided for all buried valves where the operating nut is greater than three (3') feet below finished grade. Operating nuts or extension stems shall be brought to within 6" of the finished grade. Centering collars are to be provided on all extension stems. Extension stems shall be mechanically secured to the valve stem/nut using stainless steel hardware.
- g. All flanged valves shall have laying lengths conforming to American National Standard dimensions for cast iron flanged valves, ANSI B16.10.
- h. Valves shall open by turning hand wheels or operating nuts to the left, counterclockwise.
- i. Non-rising stem gate valves shall be provided with "O" ring type packing.
- j. Rising stem gate valves shall be provided with packed boxes.
- k. Operations of valves shall be designed so that the effort required to operate the handwheel, lever, tee wrench, or chain shall not exceed 40 pounds applied at the extremity of the wheel, tee wrench, or lever.

1.03 <u>SUBMITTALS</u>

a. The Contractor shall submit for approval, full data on all valves to be furnished, including dimension drawings showing details of construction and complete materials specifications.

1.04 <u>WARRANTY</u>

a. Buried gate valves shall be warranted by the manufacturer for a 5 year period covering failures. Warranty shall cover all replacement costs.

PART 2 - PRODUCTS

2.01 GATE VALVES (RESILIENT SEAT)

- a. Gate valves shall be resilient seat type suitable for underground service complying with the requirements of AWWA C509.
- b. Gate valves shall be designed to be bubble tight for 250 psig water working pressure with no leakage past the seat from either side of the disc, and shall be hydrostatically tested to 500 psig.
- c. Gate valves shall be of the non-rising stem (N.R.S.) design.
- d. Gate valves shall be set vertically (spur gearing).
- e. Gate valves shall open <u>left</u> (counter-clockwise).
- f. Buried gate valves shall be furnished with 2 inch square operating nuts.
- g. Open-left gate valves shall have a black-painted operating nut, and open-right valves shall have a red-painted operating nut.
- h. Gate valves shall be cast iron or ductile iron. Cast iron shall meet the specifications of ASTM A126, Class B. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed. Ductile iron shall meet the standards of ASTM A536.
- i. The resilient-seated disc wedge shall be of the resilient wedge fully supported type, either cast iron or ductile iron. Solid guide lugs shall travel within channels in the body of the valve. The disc and guide lugs shall be fully encapsulated in SBR (styrene butadiene rubber) or EPDM rubber. Disc wedges that are not 100% fully encapsulated shall not be acceptable. Provide guide caps of an acetyl copolymer bearing material to protect the rubber-encapsulated solid guide lugs from abrasion for long life and ease of operation.
- j. The seat shall be SBR or EPDM rubber, matching the disc encasement. The seating surface (rubber) shall be specially designed so as to provide a smooth waterway, without depressions or cavities, which might trap debris and interfere with tight closures.

- k. The body, bonnet, and gate shall be cast/ductile iron, constructed in accordance with AWWA C-509. The bonnet to body seal shall incorporate a flat neoprene gasket. Bonnet and body flanges shall be fully machined to assure proper sealing of the gasket.
- 1. Gate valve stems shall be of bronze rolled bar stock in accordance with ASTM B584, and shall have a forged thrust collar. The thrust collar shall be factory lubricated, and the thrust collar and its lubrication shall be isolated by the O-Rings from the water way and from outside contamination, providing permanent lubrication for long term ease of operation. An anti-friction thrust washer shall be provided both above and below the thrust collar for ease of operation.
- m. Gate valves shall have O-Ring sealed stems with one O-Ring located below the thrust collar and two O-Rings located above the thrust collar. The two O-Rings located above the thrust collar shall be replaceable with the valve still in service in the fully open position.
- n. Coat internal and external exposed ferrous surfaces of the valve with a fusion-bonded, thermosetting powder epoxy coating suitable for potable water service conforming to AWWA C550. Coating shall be non-toxic and shall impart no taste to water. Coating thickness shall be nominal 5/10 mils. Gate valves for water distribution systems shall be certified to NSF 61.
- o. Seal internal and external exposed ferrous surfaces of the valve with two coats of asphaltic varnish (5 mils) suitable for potable water service conforming to AWWA C550. Coating shall be non-toxic and shall impart no taste to water. Coating thickness shall be nominal 5/10 mils. Gate valves for water distribution systems shall be certified to NSF 61.
- p. Gate valves shall be as manufactured by American Flow Control (AFC-2500), Clow (2630 Series), equivalent by American AVK, or approved equal.
- q. Gate Valves 3 inch and smaller shall have body and bonnet of ASTM B62 cast bronze with threaded or solder ends, solid disc, copper-silicon alloy stem, brass backing gland, "Teflon" impregnated packing, and malleable iron handwheel.
- r. Direct buried gate valves shall have mechanical joint ends complying with ANSI/AWWA C111/A21.1185.
- s. Gate valves shall be as manufactured by American Flow Control, Clow, American AVK, or equal.

2.02 <u>CHECK VALVES</u>

- a. The Contractor shall furnish and install air-cushioned lever and weight swing check valves as shown on the drawings.
- b. The function of the air-cushioned lever and weight swing check valves shall be to permit flow in only one direction and close tightly when its discharge side pressure exceeds its inlet pressure. Closing of these valves shall take place without a slam or a bang.

- c. The air-cushioned lever and weight swing check valves shall be constructed of heavy cast iron body with a stainless-steel fasteners, bronze trim and resilient seat, a noncorrosive shockless chamber.
- d. It shall absolutely prevent the return of liquid back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating, and must be shockless in operation. The seat ring must be renewable.
- e. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.
- f. The valve disc shall be of bronze and shall be suspended from a non-corrosive stainless-steel shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.
- g. The air-cushioned lever and weight swing check valves shall be as manufactured by Flomatic Corporation, or equal.

2.03 <u>PLUG VALVES</u>

- a. Plug valves shall be furnished and installed where shown on the Contract Drawings. In general, plug valves shall be used in all sludge and scum lines. Plug valves shall be rotated ninety (90) degrees for full open to full closed. Plug valves shall be of the non-lubricated, eccentric plug type with resilient faced plugs as manufactured by DeZurik Corp. or equal.
- b. The maximum rated working pressure for all plug valves shall be 175 psi through 12" and 150 psi for 14" and above and test pressures shall be 225 psi unless otherwise noted.
- c. Valves shall provide drop tight shut off with pressure against the plug in either direction.
- d. Port areas for valves through 20" shall be minimum 80% of full pipe area and port areas of 24" and larger valves shall be minimum 70% of full pipe area.
- e. Valve bodies shall be of ASTM A126 Class B cast iron in compliance with AWWA C504 Section 2.2. Bodies in 3" and larger valves shall be furnished with a 1/8 inch thick welded overlay seat of not less than 90% pure nickel in accordance with AWWA C507 Section 7.2. Valves utilizing resilient seats attached to the body shall not be acceptable.
- f. Plugs shall be of ASTM A126 Class B cast iron in compliance with AWWA C504, Section 2.2. The plug shall be of one piece construction and shall be capable of withstanding the full pressure rating of the valve without use of additional structural reinforcing ribs that extend beyond the profile of the plug itself. Plugs shall be resilient faced with neoprene or hycar, suitable for use with sewage.
- g. Valves shall be furnished with replaceable, sleeve type metal bearings conforming to AWWA C504-80, Section 3.6 AWWA C507-73, Section 8. Bearings shall be of sintered, oil

impregnated and permanently lubricated type 316 ASTM A743 Grade CF-8M or AISI Type 317L stainless steel. Non-metallic bearings shall not be acceptable.

- h. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable, repackable without removing the bonnet or actuator from the valve, and repackable under pressure. Shaft seals shall conform with AWWA C504, Section 3.7 and AWWA C507, Section 10.2. Valves utilizing 0-ring seals or non-adjustable packing shall not be acceptable. All exposed nuts, bolts, springs, washers, etc., shall be stainless steel for buried or submerged service valves and zinc plated for all others.
- i. Plug valves shall be provided with stops. Where indicated, extension stems and cast iron floor stands with operating handwheels and position indicators shall be furnished and installed. Where indicated on the Drawings, plug valves shall be double ended chain wrench operated. Where extension stems and double ended wrenches are called for, the extension stems shall be securely braced in a vertical position and they shall not be less than two (2") inches in diameter. Buried plug valves shall be provided with extension stem operators where indicated on the Drawings. Extension stems shall be mechanically secured to the valve stem/nut with stainless steel hardware. Operating nuts shall terminate approximately 6" below the valve boxes. Suitable tee handle wrenches shall be provided.
- j. Manual valves shall have lever or gear actuators, tee wrenches, extension stems, floor stands, and other appurtenances as indicated on the Drawings and as required. Valves 4" and less shall have non-removable levers unless otherwise specified or indicated. All valves 6" and larger shall be equipped with enclosed gear actuators conforming to AWWA C504 Section 3.8. All gearing shall be enclosed in a semi-steel, ASTM A126, Class "B" housing. Gears shall be suitable for running in a lubricant, with seals provided on all valve shafts and actuators to prevent entry of dirt and water. Each actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate the valve position; indicator shall be visible from the operating location; and an adjustable stop shall be provided to set the closing torque. In general, chain wheel operation shall be provided to extend to within 3' of the operating level.
- k. All valves shown in a location subject to submergence or buried valves and operators shall be suitable for submerged service. All exposed nuts, washers, bolts and springs shall be stainless steel.
- 1. Generally, valves shall be installed in a position which will allow the plug to rotate into the top of the valve housing when the valve is open with the seat on the upstream end. The Contractor shall coordinate the position of operators and accessories to allow installation in this manner and have the handwheel horizontal or vertical or operating stem or chain wheel vertical.

2.04 BALL VALVES

a. Ball valves, 1½ inch and smaller - rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece adaptor load construction; with bronze body conforming to ASTM B 62, single reduced port, chrome-plated brass ball, glass reinforced "Teflon" or "TFE" seats

and seals, blowout-proof stem, soldered, screwed or flanged ends, and vinyl-covered steel handle. For air service provide stainless steel ball and stem with screwed or flanged ends.

- b. Ball Valves, 2 inch and larger Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 3-piece construction; with bronze body conforming to ASTM B 62, single reduced port, chrome-plated brass ball, glass reinforced "teflon" or "TFE" seats and seals blowout proof stem, soldered, screwed or flanged ends, and vinyl-covered steel handle. For air service provide stainless steel ball and stem with screwed or flanged ends.
- c. Ball Valves Stainless steel, flanged or threaded ends, all sizes, shall be Type 316 stainless steel body, ball, stem, cap and packing gland. Packing and seats shall be teflon. Flanged valves shall be Class 150, threaded valves shall be rated for 100 psi at 400°F.
- d. Ball valves for PVC pipe shall be molded of Type 1, Grade 1 PVC and for CPVC pipe shall be Type 4, Grade 1 CPVC in accordance with ASTM D1784 with socket, threaded or flanged ends as required. Ball valves shall have Teflon ball seats and EPDM or Viton stem and body seals. Ball valves shall carry a pressure rating of 150 psig WOG at 73°F. ¹/₄ inch to 6 inch ball valves shall be of true union design.
- e. Ball valves for polypropylene pipe shall be molded of virgin non-pigmented polypropylene in accordance with ASTM D4101 with fusion welded, threaded, or flanged ends as required. Ball valves shall have Teflon ball seats and Viton stem and body seals. Ball valves shall carry a pressure rating of 150 psig WOG at 73°F ¼ inch to 6 inch ball valves shall be of the true union design.

2.05 SEWAGE COMBINATION AIR VALVE

- a. The Contractor shall provide single body sewage combination air valves as shown on the Drawings. The Sewage Combination Air Valve shall be designed to exhaust large amounts of air during filling, release small amounts of accumulated air during operation and open impending vacuum to admit large amounts of air while draining.
- b. The Sewage Combination Air Valve shall be float operated and both the Air & Vacuum and Air Release functions shall be housed in a single conical shaped body and shall have a cam lock back flush attachment. The entire valve and body shall be stainless steel 316. The valve body shall be rated for 230 psi WOG and tested to 300 psi. All leverage mechanism parts and the spherical float shall be stainless steel 316. The large and small orifices seats shall be Buna-N and shall be renewable.
- c. The Combination Air Valve shall be supplied with "Flushing Attachments" to allow periodic flushing of sediment, grease and solids. Attachments consist of: bronze blow-off and flushing valves, with a minimum of 5 feet of rubber hose, and stainless steel 316 quick disconnects to allow connection to a clean water source.
- d. The single body Sewage Combination Air Valve shall be as manufactured by A.R.I Flow Control Accessories, their Model No. D-020, D-025, Apco Series 440 (#443), Val-Matic Series 800 (#801) or equal. All stainless steel 316 construction.

2.06 TAPPING SLEEVES AND VALVES

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- a. Tapping sleeves and valves shall be as manufactured by Clow, Kennedy, Muller, Ford, or equal and shall employ a 0-ring, rubber gland type saddle.
- b. Valves and valve boxes shall comply with the pertinent provisions listed in these Specifications, with the exception that tapping valves shall be provided with flanged inlet; mechanical joint outlet ends.
- c. Work shall be carried out by personnel thoroughly experienced in the construction of wet taps, using approved methods and equipment. Certain construction methods are to be approved by the Engineer prior to any work being performed. The tapping sleeves and valves shall be securely supported and blocked by poured Class 1500 psi concrete against undisturbed ground.

2.06 <u>STAINLESS-STEEL CURB STOP/CHECK VALVE ASSEMBLY</u>

- a. The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.
- b. The stainless-steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported 1-1/4" passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.
- c. The stainless steel, combination curb stop/check valve component shall be 100 percent hydrostatically tested to 150 psi in the factory.

2.07 <u>CURB BOX (SEWER)</u>

- a. Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788. Lid top casting shall be cast iron, conforming to ASTM A-48 Class 25, providing magnetic detectability, and be painted black. All components shall be inherently corrosion-resistant to ensure durability in the ground. Curb boxes shall provide height adjustment downward (shorter) from their nominal height.
- b. In locations where the drawings call for a 1½-inch stainless-steel ball valve and 1½-inch redundant stainless-steel check valve, the Contractor shall furnish and install stainless-steel combination curb stop/check valve assemblies with curb boxes for PVC SDR 21 pipe. The combination curb stop/check valve assemblies with curb boxes shall include a stainless-steel ball valve, stainless-steel check valve, polypropylene compression adapter fittings to connect to PVC SDR 21 pipe, PVC adapter/coupling and curb box assembly. The stainless-steel ball valves and redundant stainless-steel check valves shall be as specified in the preceding paragraphs. All valves, fittings and pipe shall be pressure rated for 235 psi minimum. All pipe connections shall be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. A split collet locking device shall be integrated into all pipe connection fittings to securely restrain the pipe from hydraulic pressure and external load caused by shifting and settling. All engineered thermoplastic fitting components are to be in compliance with applicable ASTM standards. The stainless-steel combination curb stop/check valve assemblies (uni-laterals) with curb boxes for 1½-

inch PVC SDR 21 pipe shall be Model No. NB0184PXX as manufactured by Environment-One of Schenectady, New York, or equal

2.08 CURB BOX (WATER)

- a. Provide a valve box of the adjustable type of heavy pattern, constructed of cast iron and provided with a 6 inch cast iron cover for each buried valve.
- b. Valve boxes shall be manufactured in the United States of America by Clow Corporation, Tyler/Union Corporation, United States Foundries, or equal.
- c. Valve boxes shall be round, 2-piece, sliding type, cast iron. The upper section of each box shall have a flange on top having sufficient bearing area to prevent settling. The bottom of the lower section shall be belled to enclose the operating nut of the valve. The barrel shall be 5-1/2 inch O.D. minimum.
- d. Boxes shall be of lengths consistent with pipe depths. Boxes shall be adjustable, with a lap of at least 6 inches when in the most extended position.
- e. Slot covers for easy removal.
- f. Covers for valve boxes on water mains shall have the word "WATER" cast in the top.
- g. Coat valve boxes with coal-tar pitch enamel or other approved coating.
- h. Valve boxes shall be suitable for the size valve on which they are used. The length of the lower section shall be adequate for trench adjustment, no top or mid-section adapters.
- i. Provide one tee-handled wrench for every four valves installed, unless additional wrenches are required due to variations in valve bury depth. Wrenches shall be field measured to accommodate the depth of bury and provide waist high operation.

2.09 <u>FIRE HYDRANTS</u>

- a. The following listed manufacturers are acceptable; substitutions and or equals will not be accepted:
 - 1. Clow Medallion
 - 2. American AVK
 - 3. Mueller Centurion
- b. Hydrants furnished under this Contract shall be in accordance with the standard requirements of the Owner.
- c. Hydrants shall comply with all requirements of the American Water Works association for Fire Hydrants for Ordinary Water Works Service Designation C502. Hydrants shall also be UL listed and FM approve and the following specific requirements:
 - 1. The hydrant shall be a compression type shut-off with valve opening against the pressure. A negligible loss of water shall occur with breakage of the hydrant, whether the breakage occurs in the open position or the closed position.

- 2. The main valve seat shall be a minimum of $5\frac{1}{4}$ in diameter.
- 3. The inlet connection shall be 6 □ mechanical joint furnished with gasket, gland and bolts.
- 4. The bury length shall be 6'-0" minimum, or as required in each individual installation. Extensions shall be provided as needed.
- The standard hydrants shall be furnished with 2-2½ hose nozzles and one steamer (4½") nozzle having National (American) Standard fire hose threads.
- 6. The hydrant operating nut shall be turned to the LEFT (counter-clockwise) to open, and shall be National Standard pentagonal with a flat-to-point dimension of $1\frac{1}{2}$.
- 7. The hydrants shall be of the "Dry-top" design and of the design with O-ring seals. The design shall be such as to prevent the entry of water into the operating portions of the hydrant from either the barrel or from rainwater.
- 8. The seal between the shoe bushing and the seat ring shall consist of "O" rings located so as to prevent the passage of water into the barrel of the hydrant or into the drain ports from the base elbow.
- 9. Working pressure should be rated to 250 psi.
- 10. Main valve shall be one piece EPDM rubber encapsulated ductile iron.
- 11. Hydrants shall be fusion bonded epoxy coated internally and externally.
- 12. The ductile iron shoe should be replaceable without dismantling the hydrant.
- 13.Connecting pipe between the main line tee and hydrant shall be 6□ ductile iron in accordance with Section 02514.
- d. Hydrant Paint
 - 1. Hydrants shall be field painted to match the standard hydrant color of the Owner.
 - 2. Hydrants shall be thoroughly cleaned and given two shop or field coats of paint in accordance with AWWA C502 and the instructions of the paint manufacturer.
 - 3. If the hydrants are delivered with the Owner's standard color, they shall be given one matching field coat of an alkyd gloss enamel. If the hydrants are not delivered with the Owner's standard color, they shall be given two coats of an alkyd gloss enamel.
 - 4. Alkyd gloss enamel shall be 801 DTM by Sherwin-Williams, 2H-Tneme by Tenemec, or approved equal. Reflective paint shall be Scotchlite #7211 by 3M.

2.10 MISCELLANEOUS VALVES, HYDRANTS, AND SPECIALTY ITEMS

a. The Contractor shall furnish and install miscellaneous valves and hydrants where shown on the Drawings or mentioned in the Specifications.

- b. The Contractor is advised that the general schedule appearing below may not contain each and every valve or specialty item required for all the various services and conditions encountered on this project. The schedule is intended to guide the Contractor as to the most probable types of valves or specialties which would be needed to complete his work. The Contractor shall work with the Engineer in order to evaluate the requirements on a case by case basis.
- c. All valves 2-1/2 inches and smaller shall have bronze bodies and threaded ends unless otherwise noted. They shall be designed for 150 psi service pressure.
- d. All valves, hydrants and specialty valves shall be as manufactured by Walworth, DeZurik, Craen, Jenkins, Darling, Asco, Apco, Mueller, Josam, Clow, Wager, or equal. They shall be furnished and installed as required to fulfill the intent of the Drawing and Specifications.
- e. Insofar as practicable, valves and specialty items shall be furnished and installed for usage according to the following Schedule:

Туре	Fig./Model No.	General Usage
Globe Valves	95 Walworth	Shut-off (throttling)
Interior Hose Bibbs	Walworth # 24	Air and Water Service, Furnish
		Each Valve with an Adapter to a
		Fit Universal Quick Hose
		Coupling
1-1/2" Flushing	Dezurik/Fig 120	Connections
Universal Quick	Kamlock Type 633	Flushing Connections
Acting Couplings		-
Odor Control Sewer Valve	Wager Model 2050-50	Odor Control

- f. Heavy steel extension stems with adjustable cast iron couplings and bronze-bushed adjustable supports shall be provided and installed by the Contractor where required for convenient operation of valves. Extension stems shall be stainless steel where stems are subject to submergence or on buried valve applications. Extension stems shall be mechanically attached to the valve stem/nut using stainless steel hardware. Floor boxes, cast in the concrete, shall be furnished where required and shall be of the bushing type.
- g. Chain wheels shall be provided where shown on the Drawings or as specified, and shall be provided with deep flanges and teeth; chain guides; and the proper length of rustproof chain.
- h. Floor stands, bench stands shall be provided with suitable structural supports or be mounted on concrete structures. They shall not be supported from gratings.

PART 3 - EXECUTION

3.01 INSTALLATION PROCEDURES

a. Valves shall be set plumb, and where required, shall be securely supported or hung. Valves shall be packed and adjusted prior to field tests and shall be left in good operating condition. Valves shall be painted to conform to adjoining piping. Valve boxes shall be positioned

507408636-002 February 2020 directly over the valves. After being correctly positioned for line and grade, the earth fill shall be carefully tamped around the valve box. The top of the box shall be set flush with pavement surfaces in paved areas and shall be one (1") inch above ground in grassed or earth areas. Valve boxes on buried valves shall be cleaned out; boxes shall be centered on operating nuts to permit free movement of valve keys.

b. Valve boxes shall be color-code painted in accordance with the service line.

3.02 INSPECTION AND TESTING

a. Valves and hydrants shall be inspected and tested in conjunction with the pipelines in which they are installed in.

3.03 <u>GUARANTEE</u>

a. Final acceptance of all equipment furnished under these Specifications will be withheld until after the installation and field testing by the Engineer. All valves, specialties and appurtenances shall be guaranteed as to design, materials, and workmanship for a period of one (1) year from date of final acceptance, unless otherwise specified.

END OF SECTION

<u>SECTION 15122</u> <u>HIGH DENSITY POLYETHYLENE (HDPE) FORCE MAINS</u>

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. Work consists of furnishing and placing high density polyethylene pressure pipe (HDPE), materials, fittings, butt fusion, testing operations, and providing all incidental work needed for a complete installation.
- b. Force mains denoted on the Drawings as 3-inch diameter shall be provided as HDPE SDR-11 pipe.

1.02 <u>RELATED WORK</u>

a. Section 15990 – Leakage and Testing

1.03 <u>REFERENCES</u>

- a. American Water Works Association (AWWA):
 - 1. AWWA C901 Polyethylene Pressure Pipe and Fittings, ½ IN through 3 IN for Water.
 - 2. AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution.
- b. American Society for Testing and Materials (ASTM):
 - 1. ASTM D-638 Test Method for Tensile Properties of Plastics.
 - 2. ASTM D-790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 3. ASTM D-1238 Test Method for Flow Rates of Thermal Plastics by Extrusion Plastometer.
 - 4. ASTM D-1248 Specification for Polyethylene Plastics Molding and Extrusion Materials.
 - 5. ASTM D-1505 Test Method for Density of Plastics by the Density Gradient Technique.
 - 6. ASTM D-1599 Test Method for Short Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.
 - 7. ASTM D-1693 Test Method for Environmental Stress Cracking of Ethylene Plastics.
 - 8. ASTM D-2122 Method for Determining Dimensions of Thermal Plastic Pipe and Fittings.
 - 9. ASTM D-2239 Polyethylene Plastic Pipe (SIDR-PR) (Iron Pipe Size, Inside Diameter).
 - 10. ASTM D-2737 Polyethylene Plastic Tubing (Copper Tube Size; Outside Diameter).
 - 11. ASTM D-2837 Method for Obtaining Hydrostatic Design Basis for Thermal Plastic Pipe Materials.
 - 12. ASTM D-3350 Specification for Polyethylene Plastics Pipe and Fittings Material.
 - 13. ASTM D-4218 Test Method for Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
 - 14. ASTM F-714 Standard Specifications for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 - 15. ASTM F-1248 Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe.
- c. Each manufacturer shall have an approved in-house QA/QC program providing compliance of the testing specifications and requirements for both pipe and fittings and shall be ISO9001 certified.

1.04 <u>SUBMITTALS</u>

- a. Provide results from all testing required in accordance with AWWA standards during the Manufacturing of the pipe or pipe installation.
- b. Provide details of joints, piping layout, gasket material, material certification and manhole connection details for each class and size of pipe.
- c. Fusion welder's qualification and certification.

1.05 **QUALIFICATIONS**

- a. HDPE fusion welder shall have a minimum of 2 years of nearly continuous experience welding this type and size of pipe and be certified by the pipe manufacturer as a qualified welder. Welder shall complete a minimum of a 2-hour training class provided by the pipe manufacturer or fusion equipment manufacturer specifically for the size and type of pipe to be used on this project. Training class shall be provided prior to fusion welding pipe for this project.
- b. Pipe shall be the product of one manufacturer and size indicated.

PART 2 - PRODUCTS

2.01 <u>MATERIALS</u>

- a. Pipe
 - 1. Type: IPS
 - 2. Pressure Class: Provide SDR-11 for 3-inch pipe.

3. The polyethylene pipe and fittings shall be a PE 3408 high density, high extra molecular weight polyethylene pipe made from prime virgin resins exhibiting a cell classification of PE 345464C as defined in ASTM D3350 with an established hydrostatic-design basis of 1600 psi for water at 73 deg F.

4. The resin shall be listed by the PPI (Plastic Pipe Institute) in its pipe-grade registry "TR-4", "Listing of Plastic Pipe Components".

5. Joints for polyethylene pipe shall be heat fusion type in accordance with AWWA C901.

6. Pipe and fittings must be marked as prescribed by ASTM F714 and NSF. Pipe markings will include nominal size, OD based (IPS or DI), dimension ratio, pressure class, working pressure rating (WPR), ASTM F714, manufacturer's name, manufacturer's production code including day, month, year extruded, and manufacturer's plant and extrusion line.

7. Permanent identification of sewer piping shall be provided by co-extruding longitudinal green stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the outside surface shall not be acceptable.

b. Fittings:

1. The HDPE fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining, or shall be fabricated from AWWA C906 pipe conforming to this Specification. All fittings shall be provided/recommended by the manufacturer of the pipe on each project. The fittings shall be manufactured from the same resin type, grade and cell classification as the pipe itself. The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe. The manufacture of the fittings shall be in accordance with good

commercial practice to provide fittings homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects. The fitting shall be as uniform as commercially practicable in color, opacity, density, and other physical properties. The minimum "quick-burst" strength of the fittings shall not be less than that of the pipe with which the fitting is to be used. All fittings shall be pressure tested by the pipe/fitting manufacturer to the specification and requirements of AWWA C906. Standard fittings are tees, elbows, flange adapters, reducers, transition fittings, branch and service saddles, and hot-tap tees. The ends of all fittings shall be tapered to provide the same dimension ratio as the pipe.

- c. Installation: Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer's printed recommendations and in full observance to plan details when more stringent.
- d. Uniformity: Ensure that all piping and fittings are integrated into components of the finished system. Utilize products of a single manufacturer.

PART 3 - EXECUTION

3.01 <u>GENERAL</u>

- a. In no case shall the loads on the pipe exceed the maximum safe load recommended by the manufacturer.
- b. Any evidence of splitting, cracking, cuts, gouges or breaking shall be cause for the pipe section to be rejected.
- c. In sections where a fitting is present, the minimum bending radius shall be 125 times the pipe diameter. In section without fittings the minimum bending radius shall be 30 times the pipe diameter.

3.02 JOINTING

- a. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements of 400 deg F, alignment, and 75 psi interfacial fusion pressure.
- b. Heat fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications nor in fabrications where shear or structural strength is important. Flanges, unions, grooved-couplers, transition fittings, and some mechanical couplers may be used to mechanically connect HDPE pipe without butt fusion. Refer to the manufacturer recommendations.
- c. Joints between pipe sections shall be smooth on the inside and internal projection beads shall not be greater than 3/16-inch.

3.03 PACKAGING, HANDLING, STORAGE

a. The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate

methods and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.

- b. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The handling of the pipe shall be done in such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.
- c. Sections of pressure pipe having been discovered with cuts or gouges in excess of 10% of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the fusion joining method.
- d. Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable type chokers must be avoided. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections. Care must be exercised to avoid cutting or gouging the pipe.

3.04 <u>CONNECTIONS</u>

- a. Unless otherwise shown on the Drawings, polyethylene pipe shall be joined to ductile iron pipe by the use of flange adapters and back-up rings. Flange adapters shall be butt fused to the polyethylene carrier pipe. The face of the flange adapter shall have a serrated sealing face to assist in holding the flange gasket in place. Flange gaskets shall be full-faced neoprene. Back-up rings shall be Class "D" steel ring flanges in accordance with AWWA C207. Flange bolts must span the entire width of the flange joint, and provide sufficient thread length to fully engage the nut.
- b. Where noted on the Drawings, mechanical joint adapter fittings shall be used to join polyethylene pipe to ductile iron fittings. Adapter fittings shall be furnished in ductile iron pipe size (DIPS), and provided with an internal stainless steel stiffener. Adapter shall be fusion welded to polyethylene pipe and furnished in the same DR as the polyethylene pipe.

3.05 <u>TESTING</u>

a. Refer to Section 15990 for force main testing requirements.

END OF SECTION

SECTION 15200 PIPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- a. The Contractor shall furnish, lay and joint, paint and test metal, plastic or other material pipes, fittings and wall pieces as shown on the Drawings and as required to fulfill the intent of the Specifications. A general materials and jointing schedule is set forth in the Schedule of Pipe and Jointing included in the Specifications. Joints for ductile iron piping shall be flanged, mechanically coupled, rubber ring, bell and spigot, or split couplings of the flexible gasketed mechanical type as called for on the Schedule of Pipe and Jointing or as shown on the Drawings.
- b. Although certain construction operations described above are a necessary part of the pipe, valve and accessory installation; the materials and installation specifications may not be included in this division or section. The Contractor shall refer to the appropriate sections or divisions of the Specifications for work other than piping and valves which may be related to the work defined in this section.
- c. The Contractor is advised that making connections to existing pipelines or relocating existing pipelines or appurtenances requires careful consideration as to the construction techniques employed. The Contractor shall be solely responsible for maintaining existing pipelines in such a manner as to prevent disruption of services or prevent bypassing of untreated wastewaters directly or indirectly to any watercourse or underground aquifer.
- d. Under this Section, the Contractor shall furnish and install flexible couplings, expansion joints, connections and seals as shown on the Drawings and as described herein. The couplings furnished are to be installed by the Contractor in accordance with the best acceptable practice as shown on the Drawings and as directed by the Engineer.
- e. Ample provisions shall be made in all pipelines to compensate for linear expansion and transverse movement whether caused by thermal stresses or by the dynamic conditions of pump operation. Unless other forms of expansion joints are specified, all runs of pipe subject to changes in length shall be fabricated shorter than their theoretical length to the extent of one-half of the expansion and shall be so erected that the pipe is free to expand without increasing the stresses imposed when cold. When the fore going method of compensation for expansion is not adequate, the Contractor shall furnish and install, in the pipelines, expansion devices (i.e. pipe expansion joints) that will be adequate to allow the lines to expand and contract freely without injury to any part of the piping system or its support. The devices may be in the form of connections such as expansion joints, swivel or swing joints, or pipe beds, and shall include such anchors and alignment guides as may be shown, specified, recommended by the joint manufacturer, or required to make the device effective.

1.02 **QUALITY ASSURANCE**

a. All piping is to be engineered, manufactured and assembled in the United States under a written Quality Assurance program. This written Quality Assurance program shall have

been in effect for at least five (5) years, and include a written record of periodic internal and external audits to confirm compliance with UL Quality Assurance specifications.

- b. All flexible couplings are to be engineered, manufactured and assembled in the United States under a written Quality Assurance program. This written Quality Assurance program shall have been in effect for at least five (5) years, and include a written record of periodic internal and external audits to confirm compliance with UL Quality Assurance specifications.
- c. The flexible coupling manufacturer must have a minimum of 10 years of experience supplying coupling services and shall, at the request of the Engineer, provide a list of installation involving pipelines of a similar size and application.

1.03 <u>REFERENCES</u>

- a. ASTM A536 Standard Specification for Ductile Iron Castings.
- b. ANSI/AWWA C115/21.15 Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
- a. ANSI/AWWA C151/21.51 Ductile Iron Pipe, Centrifugally Cast for Water.
- b. ANSI/AWWA C153/A21.53 Ductile Iron Compact Fittings for Water Service (54" through 64" sizes).
- c. ANSI/AWWA C116/A21.16 Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Supply Service.
- d. ANSI/AWWA C104/A21.4 Cement Mortar Lining for Ductile Iron and Gray Iron Fittings for Water.
- e. ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- f. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.04 **GENERAL INFORMATION**

- a. All interior (non-buried) ductile iron piping shall be painted and shall, therefore, be supplied without outside bituminous coating. All buried ductile iron piping shall receive outside bituminous coating in accordance with the latest revision of AWWA C106. Jointing of buried piping shown as mechanical may be replaced with approved rubber gasketed push-on joint at the Contractor's opinion, unless otherwise directed by the Engineer. All buried fittings on all piping shall be secured for thrust conditions utilizing a combination of concrete thrust blocks with tie rods or mechanical joint restraints as permitted by the Engineer. Joint restraining lengths required at bends and fittings will be based on calculations utilizing the line test pressure or water hammer pressures; whichever are larger. Calculations showing the restrained lengths are to be submitted to the Engineer for review.
- b. Pipe and fitting materials, jointing and pipe lining shall be in accordance with the following schedule. This schedule is set forth as a guide to illustrate requirements. The lack of the specific mention of any particular pipeline does not relieve the Contractor from the 5074089636-002
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responsibility for furnishing, installing, painting and testing such a pipeline in accordance with the requirements of these Specifications and the following schedule.

Service	Pipe Material	Jointing		
a. Ductile Iron Sanitary Force	Pressure Class 200	Gasketed, Push-On Joints,		
Mains		Restrained Joint Fittings		
b. HDPE Sanitary Force Mains	IPS, SDR-11	Butt fused		
c. Low Pressure Sewer and	SDR-21 PVC	Gasketed, Push-On Joints		
Laterals				
d. Gravity Sewer	C-900, SDR-26, SDR-35 PVC	Gasketed, Push-On Joints		
e. Gravity Laterals	SDR-35 PVC	Gasketed, Push-On Joints		
f. Storm Drains	RCP	Gasketed, Push-On Joints		

Table 15200.A –Piping Schedule

1.05 <u>SUBMITTALS</u>

a. Submit material specifications and shop drawings for all materials furnished under this section

PART 2 - PRODUCTS

2.01 FORCE MAINS

a. Refer to Section 15122, High Density Polyethylene Force Mains.

2.02 LOW PRESSURE SEWER

a. Refer to Section 15070, Polyvinyl Chloride Pipe.

2.03 <u>GRAVITY SEWER</u>

a. Refer to Section 15070, Polyvinyl Chloride Pipe.

2.04 FLANGED DUCTILE IRON PIPE (NON-BURIED SERVICES)

- a. Flanged ductile iron piping shall have ductile iron flanges conforming to ANSI B16.1 Class 125 specifications designed for use with ANSI/AWWA C110/A21.10 flanged fittings, with pipe barrel conforming to ANSI/AWWA C151/A21.51, latest revisions with the previously mentioned exception. Ductile iron piping shall be threaded and flanged in the foundry.
- b. The flanges shall be of the long hub type; screwed on the pipe barrel; power tightened by machine; and faced and drilled after tightening. No ductile iron pipe of class thickness less than Class 53, shall be threaded and flanged. All non-buried ductile iron piping at the pump stations shall be factory primed and field coated with an approved epoxy. All Flanges shall be of US manufacture. Flange gaskets shall be Toruseal as manufactured by American Cast Iron Pipe Company, or equal. All ductile iron piping shall be provided with an internal lining system in accordance with Paragraph 2.07 of this Section.

2.05 DUCTILE IRON PIPE (BURIED SERVICES)

- a. Ductile iron pipe shall be centrifugally cast for a standard pressure class of 200 psi and shall conform to the following standards: ANSI/AWWA C151/A21.51. Push-on joints and mechanical joints shall conform to ANSI/AWWA C111/A21.11, latest revision. Bell and spigot joints shall conform to Table 6.6, AWWA C106 (ANSI A21.6), latest revision, and shall be made with poured lead and caulked in accordance with best practice and as specified herein. Only buried and non-exposed ductile iron pipe shall receive an outside bituminous coating.
- b. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi for sizes 4-inches through 24-inches. All fittings for ductile iron pipe shall be Class 250 ductile iron conforming to ANSI standards A21.10 and A21.11 for mechanical joint or push-on joint. The restraint of fittings shall be with thrust rods, concrete blocking or locktight gaskets as appropriate for the pressures anticipated, and as further directed in the field, considering particular conditions of installation. All ductile iron piping shall be provided with an internal lining system in accordance with Paragraph 2.07 of this Section.

2.06 <u>REINFORCED CONCRETE PIPE AND FITTINGS (STORM DRAIN)</u>

- a. The Contractor shall furnish, lay, joint and test all reinforced concrete pipe and fittings as shown on the Drawings and specified herein. Anchors and supports shall be furnished and installed as required. All necessary bends, fittings, closures, flared end sections and joints shall be furnished and installed according to approved schedule showing proposed pipe layout and laying instructions.
- b. Buried gravity drain piping shall be circular reinforced concrete sewer pipe conforming to ASTM Designation C76. Fittings and specials shall be so constructed as to meet the same strength and leakage requirements as the pipe and shall have identical joints. All drainage piping shall be in accordance with the following Schedule and as indicated on the Drawings:

Pipe Size	Minimum Depth of Cover (Surface to top of pipe)	ASTM C76 Class Pip					
	17-feet	III					
12-inch	12-feet	IV					
	7-feet	V					
24 inch	15-feet	III					
24-IIICII	6-feet	V					

Table 25200.B – RCP Schedule

- c. Joints for drainage piping shall be of the rubber and concrete type. Each joint shall be sealed with a continuous ring, round rubber gasket so that the joint will remain watertight under all conditions of service. Each length of pipe shall be provided with bell and spigot ends in the concrete wall; ends shall be designed to enclose and compress the gasket after pipes are joined. Gasket joints shall be in accordance with ASTM Designation C443.
- d. Pipe shall be capable of withstanding external loads of depth of backfill material from finished grade to crown of the pipe as shown on Drawing plus AASHTO H-20 truck wheel loading with two passing wheel loads.

2.07 DUCTILE IRON FITTINGS

a. All fittings shall be mechanical joint ductile iron fittings conforming to AWWA C110 and/or AWWA C153, AWWA C104 and AWWA C111. All fittings shall be supplied and secured with the use of mechanical joint restraints and bell harness restraints. All ductile iron fittings shall be Class 250 ductile iron conforming to ANSI Standards A21.10 and A21.11 for mechanical joint or push-on joint. The restraint of fittings shall be with concrete thrust blocking appropriate for the pressures anticipated and as further directed in the field, considering particular conditions of installation. All fittings shall be of the size and type shown on the Drawings or as directed by the Engineer, or as required to provide the appropriate change in direction of the wastewater conveyance pipeline alignment or connection to the existing structures/pipelines. No ductile iron fittings of foreign manufacturer will be accepted.

Lining System (Interior)

- a. All ductile iron fittings shall be internally coated with Protecto 401 or equal epoxy lining. The lining material shall be an amine cured novalac epoxy containing at least 20% of volume of ceramic quartz pigment, minimum of 40-mils thick. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties, and a certification of the results.
- b. All lined ductile iron fittings shall be checked for liner thickness using a magnetic film thickness gauge. The thickness testing shall he done using the method outlined in SSPC-PA-2 Film Thickness Rating. The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500-volt test. Any defects found shall be repaired prior to shipment. Each ductile iron fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work. The fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.
- c. Repair damaged lining caused by field cutting operations or handling and clean any exposed metal by sanding or scraping. Sandblasting or power tool cleaning roughening is also acceptable. It is recommended that any loose lining be removed by chiseling, cutting, or scraping into well adhered lined area before patching. Be sure to overlap at least 1-inch of lining in the area to be repaired. With the area to be sealed or repaired cleaned and suitably roughened, apply a coat of the protecting compound per manufacturer's recommendations or equal.

Bituminous Coating (Exterior)

a. Buried and non-exposed ductile iron pipe shall receive an outside bituminous coating from the factory.

2.06 <u>MECHANICAL JOINT RESTRAINTS</u>

a. In addition to thrust blocks, each ductile iron fitting and all valves shall be supplied with a mechanical joint restraint. Restraint devices for nominal pipe sizes 3-inches through 36-inches shall be consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have

a working pressure rating equal to that found in the most current product brochure. Ratings are for water pressure and must include a minimum factor of safety of 2:1 in for all sizes

- b. The gland body, wedges and wedge actuating components shall be cast from Grade 65-45-12 ductile iron material in accordance with ASTM A536. Three (3) test bars shall be incrementally poured per production shits as per UL specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8. Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.
- c. The following traceability features must be provided on each mechanical joint restraint:
 - 1. An ID number consisting of the year, day, plant and shift shall be cast into each gland body;
 - 2. All physical and chemical test results shall be recorded such that they can be accessed via the ID number on the casting;
 - 3. Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality tests are passed;
 - 4. All components shall be manufactured and assembled in the United States.
- d. Mechanical joint restraints shall meet or exceed the requirements of ASTM F1674 of the latest version for 4-inch through 24-inch fittings.
- e. Coating for restraint devices shall consist of the following:
 - 1. All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of (2) coats of liquid thermoset epoxy coating with heat cure to follow each coat;
 - 2. All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance;
 - 3. The coating system shall be MEGA-BOND, by Ebaa Iron, Inc., or equal. Requests for an approved equal must submit coating materials and process details for review;
- f. Mechanical joint restraint shall require conventional tools and installation procedures per AWW C600, while retaining full mechanical joint deflection during assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.
- g. Mechanical joint restraints shall be Series 2000PV as manufactured by EBAA Iron, Inc., the equivalent Ford Meter Box Co. or Star Pipe Products, or equal.

2.07 <u>METALLIC TRACER TAPE</u>

a. All buried pipe and fittings shall be installed with metallic-lined underground tracer tape located no more than 24 inches below final grade to allow detection by a metal detector. Underground metallic marking tape shall be a 6-inch wide, detectable marking tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core,

and then laminated to a 3.75 mil clear virgin polyethylene film. It shall be highly visible and meet the APWA Color-Code standard for identification of buried utilities with the associated phrases stamped in black letters and repeated at a maximum interval of 40 inches.

- b. Sanitary Sewer: "CAUTION SANITARY SEWER BURIED BELOW" in green.
- c. Storm Drain: "CAUTION STORM DRAIN BURIED BELOW" in green.
- d. Detectable marking tape shall be Pro-Line Safety Products or equal.

2.08 <u>SEALS</u>

- a. Seals shall be manufactured by Link-Seal of the GPT, EnPro Industries or equal and consist of modular mechanically connected and tightened, synthetic rubber links placed in the annular space between the concrete manhole wall and the principal pipe and be on both faces of the wall sleeve. Seals shall continuously fill the annular space between the penetrating pipe and the inside of the opening in the wall and designed to provide a completely watertight seal against a hydrostatic head of 20 psig.
- b. All seals shall be installed, where possible, so that they can be adjusted and tightened from the interior of structures, from the dry sides of walls and from the top of slabs. Seals are to be provided with stainless steel hardware. The seals shall be utilized to make a watertight connection to the core drill or concrete opening where indicated on the Drawings. A penetration shall be sealed with a double link seal configuration to obtain a watertight seal.
- c. All link seals shall be grouted on the interior and exterior of the manhole using approved anti-hydro cement. Each link shall have permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element. All seals shall be provided with stainless steel hardware.

2.09 TRANSITION COUPLING (FOR GRAVITY PIPELINES)

- a. The Contractor shall furnish and install all pipe couplings where shown on the drawings, where required or directed to provide proper jointing of piping for all services, or as specified herein. Pipe couplings shall be deemed to include all flexible couplings, long couplings, reducing couplings, insulating couplings, compression couplings, cast couplings, lock couplings, split couplings, sleeve type couplings, and mechanical type couplings. Couplings shall have pressure ratings at least equal to the test pressures applied to the pipes being joined. Gaskets shall be of elastomeric synthetic rubber material and shall be of the type and composition recommended by the coupling manufacturer for the service and temperature intended. Where connections are to be made between new PVC pipe and existing pipe, the Contractor shall provide appropriate transition couplings suitable for the actual pipe diameters found in the field. All couplings shall be provided with Type 316 stainless steel hardware.
- b. Sleeved couplings shall be of the flexible, gasketed sleeve type, of type and diameter to properly fit the pipes to be joined and consisting basically of a middle ring, two gaskets and followers and steel bolts to compress the gaskets. The coupling type and design shall be as recommended by the coupling manufacturer for the pipe sizes, materials and pressures intended. Couplings used to connect SDR-26 PVC to SDR-26 PVC pipe, SDR-35 PVC to SDR-35 PVC pipe, and C-900 PVC to C-900 PVC pipe shall be as manufactured by

Harrington Corporation, or equal. All other pipe material couplings shall be Hymax Series 2000 as manufactured by Total Piping Solutions Incorporated, or equal. All couplings shall be adequately harnessed to withstand the test pressures in the lines unless other means are provided to take the thrust.

- c. Adapters required for joining of different materials shall be provided as required or directed. The type of adapter shall be as recommended by the manufacturer of the pipe involved and as approved by the Engineer. Adapters to connect SDR-26 PVC, SDR-35 PVC, and C-900 PVC shall be as manufactured by Harrington Corporation, or equal. Adapters may not be used in lieu of grooved type flanges.
- d. The appropriate type and style coupling shall be as manufactured by Harrington Corporation, Total Piping Solutions Incorporated, Fernco Incorporated (Strongback couplings), or equal.

2.10 HARNESSED FLEXIBLE COUPLINGS

a. Couplings are to be furnished and installed by the Contractor where shown on the Drawings and as directed by the Engineer. Flexible couplings shall be installed in accordance with the recommendations of the particular manufacturer whose materials is being supplied and all flexible couplings shall be adequately harnessed and tied to withstand the test pressures of the pipelines. The pipe shall be furnished with plain ends for couplings in accordance with AWWA specifications on tolerances. The pipe ends shall be smooth and round for a distance of 8-inches from each end. The maximum plus or minus variation from nominal outside diameters for each size shall not exceed the following:

Size	Maximum Variation				
3" thru 12"	0.06"				
14" thru 24"	0.08"				

- b. The maximum outside pipe diameter at the ends shall be such as to permit the passing of a ring gauge having an internal bore not greater than 0.01" larger than the maximum allowable outside diameter of the pipe. This ring gauge shall go over the end of the pipe for a distance of 8-inches for all sizes up to and including 24-inches, and for a distance of 12-inches on sizes above 24-inches. The minimum outside diameter of the pipe end shall be determined by the use of a steel tape circumferentially applied to prevent the shipment of undersize, out-of-round pipe which, if measured diametrically through the maximum diameter or checked with a No-Go ring gauge, might appear within the specified tolerance.
- c. The pipe couplings shall be of a gasketed, sleeve-type, with diameter to properly fit the pipe. Each coupling shall consist of one (1) steel middle ring, of thickness and length specified, two (2) steel followers, two (2) rubber-compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling. The middle ring and followers of the coupling shall be true circular sections free from irregularities, flat spots, or surface defects. They shall be formed from mill sections with the follower-ring section of such design as to provide confinement of the gasket. After welding, they shall be tested by cold expanding a minimum of 1% beyond the yield point. The coupling bolts shall be of the elliptic-neck, track-head design with rolled threads. The manufacturer shall supply information as to the recommended torque to which the bolts shall be tightened. All bolt holes in the followers shall be oval for greater strength.

- d. The gaskets of the coupling shall be composed of a crude or synthetic rubber base compounded with other products to produce a material which will not deteriorate from age, from heat, or exposure to air under normal storage conditions. It shall also possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature or other adjustments of the pipe line.
- e. The couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc.

2.11 <u>PIPE INSULATION</u>

a. Contractor shall insulate all piping where depth of cover is less than 4-feet. Pipe insulation shall be Pittsburgh Corning Foamglas One or equal conforming to ASTM C552, Standard Specification for Cellular Glass Thermal Insulation. Insulation shall be suitable for direct burial/underground applications. Material shall be 2-inch thick and furnished pre-formed to fit the curvature of the pipe. Pipe insulation shall be covered in the field with self-sealing membrane. Membrane shall be PITTWRAP SS (Self Seal) jacketing or equal 70 mil thick. The jacketing shall consist of a polymer modified bituminous compound reinforced with a glass fabric and a 1 mil aluminum top film and release paper backing.

PART 3 - EXECUTION

3.01 <u>PIPE INSTALLATION</u>

- a. All products shall be utilized and installed in accordance with the Manufacturer's written instructions.
- b. Ductile iron piping shall be installed in accordance with AWWA C600 and AWWA M41.
- c. All pipe shall be laid and maintained to the required lines and depths. Fittings and valves shall be at the required locations with joints centered, spigots home and all valve stems plumb and otherwise in strict accordance with the Specifications.
- d. All buried steel lugs, rods, brackets and flanged joint bolts and nuts shall be given one (1) coat of coal tar coating prior to backfilling and polyethylene encased if the specifications require polyethylene encasement of pipe.
- e. No deviation shall be made from the required alignment, depth or grade except with the written consent of the Engineer.
- f. All pipe shall be laid to the depth specified. The depth shall be measured from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the Drawings or as specified in the Specifications.
- g. Do not lay pipe in a wet trench, on sub-grade containing frost, and when trench conditions are unsuitable for such work. If all efforts fail to obtain a stable dry trench bottom and the

Engineer determines that the trench bottom is unsuitable for trench foundation, he will order in writing the kind of stabilization to be constructed.

- h. Thoroughly clean the pipes and fittings before they are installed, and this material shall be kept clean until the acceptance of the completed work. Lay pipe with the bell ends facing in the direction of laying, unless otherwise shown on the Drawings, or directed by the Engineer. Exercise care to ensure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs in the pipe line.
- i. No wedging or blocking is permitted in laying pipe unless by written order of Engineer.
- j. Before joints are made, bed each section of pipe the full length of the barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.
- k. Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.
- 1. Walking or working on completed pipeline, except as necessary in tamping and backfilling, is not permitted until trench is backfilled one foot (1') deep over top of pipes.
- m. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.
- n. Take up and replace with new, such in-place pipe sections found to be defective. Replacement work shall be at the Contractor's expense.
- o. Take necessary precautions to prevent the floating of the pipeline by the accumulation of water in the trench, or the collapse of the pipeline from any cause. Should floating or collapse occur, restoration will be at the Contractor's expense.
- p. Bedding materials and concrete work for the pipe bedding and thrust restraint shall be as specified.
- q. Take every precaution to prevent foreign material from entering the pipe while it is being placed. During laying operations, do not place debris, tools, clothing, or other materials in the pipe.
- r. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods.
- s. Place enough backfill over the center sections of the pipe to prevent floating.
- t. Carry out the cutting of pipe only with equipment specifically designed for that purpose such as an abrasive wheel, rotary wheel cutter, a guillotine pipe saw or a milling wheel saw. The use of chisels or hand saws will not be permitted.
- u. In distributing material at the side of the work, each piece should be unloaded opposite or near the place where it is to be laid in the trench.

- v. If the pipe is to be strung out, it shall be done so in a straight line or in a line conforming to the curvature of the street. Each length of pipe shall be adequately blocked to prevent movement. Stockpiled pipe shall be adequately blocked to prevent movement. No pipe, material or other object shall be placed on private property, obstruct walkways or driveways, or in any manner interfere with the normal flow of traffic.
- w. Care shall be exercised, during handling temporary storage or construction to avoid damage to the bells, spigots or flanged ends. If damaged pipe cannot be repaired to the Engineer's satisfaction, it shall be replaced at the Contractor's expense.
- x. The Contractor shall remove all existing pipe, fittings, valves, pipe supports and blocking and all other items necessary to provide space for making connections to existing pipe and installing all piping which is to be done under this Contract.
- y. The Contractor shall be responsible for maintaining the minimum required distance between the water line and other utility lines in strict accordance with all Federal, State and Local requirements and all right-of-way limitations, unless otherwise indicated in the Contract Documents.
- z. Maximum allowable deflection at the joints for push-on joint pipe, shall be in accordance with the manufacturer's recommendations.
 - 1. In case the curve is too sharp for the allowable deflection, short lengths of pipe may be used upon approval of the Engineer and at no additional cost to the Owner.
- aa. Particular care shall be exercised so that no high points are established where air can accumulate. In the event that unforeseen field conditions necessitate a change in the pipe profile and, in the opinion of the Engineer, the resulting change requires the installation of an air release valve and manhole, install the same as extra work to the Contract. If the Contractor requests a change in the pipe profile solely for ease of construction, and the requested change requires the installation of an air release valve and manhole as determined by the Engineer, then the cost of furnishing and installing the air release valve and manhole will be at the expense of the Contractor.
- bb. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.
- cc. C-900 PVC, SDR-26 PVC, and SDR-35 pipe installation shall also follow the following additional requirements:
 - 1. Install buried piping as shown, specified, and in accordance with the recommendations of the manufacturer. Pipe shall be laid to the line and grade shown on the Drawings. Deviation to avoid unanticipated obstructions shall be only by approval of the Engineer. Slope pipe uniformly between elevations. The pipe shall be handled carefully at all times. Wire rope, chains, and unpadded metal handling equipment are unacceptable. When the pipe is unloaded or strung along the line of work, it shall be blocked off of the ground with padded blocks, sand bags, or mounds of sand to protect the pipe. The pipe shall not be rolled, dragged, or skidded along the ground at any time. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Defective materials shall be immediately removed from the site. Any pipe, fitting or accessory found to be broken or defective after it has been installed shall be

removed and replaced at no cost to the Owner. A watertight pipe plug or bulkhead shall be provided and used to prevent the entrance of foreign material whenever pipe-laying operations are not in progress.

- 2. Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this specification section have been selected based on the non-expectation of the encountering petroleum products or organic solvents. If during the course of pipeline installation, the Contractor identifies, or suspects, the presence of petroleum products or any unknown chemical substance, the Engineer is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the Engineer.
- 3. The assembly of joints shall be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or positioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe manufacturer or his literature for the significance. In all cases, clean the gasket, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.
- 4. Lubricant should be applied as specified by the pipe manufacturer. Bacterial growth, damage to the gaskets or the pipe, may be promoted by use of non-approved lubricants. Use only lubricant supplied by the pipe manufacturer.
- 5. After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion.
- 6. To join field-cut pipe, it is necessary to first prepare the pipe end. A square cut is essential for proper assembly. The pipe shall be marked around its entire circumference prior to cutting to assure a square cut. Use a factory-finished beveled end as a guide for proper bevel angle, and depth of bevel plus the distance to the insertion reference mark. The end shall be beveled using a pipe beveling tool or a wood rasp which will cut the correct taper. A portable sander or abrasive disc may also be used to bevel the pipe end. Round off any sharp edges on the leading edge of the bevel with a pocket knife or a file.
- 7. If a pry bar or backhoe is used for assembly of the PVC pipe, a wood plank should be placed between the pipe and machine to prevent damage. The force applied to the pipe shall be steady. Do no ram or hit the pipe.
- 8. PVC pipe shall not be laid when there is water in the trench. All foreign matter or dirt shall be removed from the inside of the pipe before jointing and piping shall be kept clean by approved means during and after laying of pipe.

- dd. Install underground piping with restrained joints at horizontal and vertical changes in direction in accordance with the Drawings.
- ee. All valves, bends or other fittings shall be provided with at least six (6) inches of broken stone base.
- ff. No specific infiltration requirements must be met for reinforced concrete pipe, except that no visible streams of water or other obvious infiltration entering the pipelines shall be permitted in the completed installation.

END OF SECTION

SECTION 15990 LEAKAGE TESTING

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. Prior to final acceptance and commissioning of the sewers and force main, the Contractor shall conduct the following acceptance tests:
 - 1. Gravity sewers and storm drainage systems: Vertical deflection test
 - 2. Gravity sewers: TV Inspection
 - 3. Gravity sewers: Low pressure air test
 - 4. Force mains: hydrostatic pressure test
 - 5. Sewer Manholes: Vacuum Test
- b. The gravity sewers and force mains shall be considered acceptable when the results of all acceptance tests meet the requirements of this section as approved by the Owner and Engineer. The Contractor shall be responsible to repair or replace all defective materials or workmanship determined from the acceptance tests. The pipe system under test and any closures in the test section should be restrained against sudden uncontrolled movement from catastrophic failure. Piping system rupture may result in sudden, forcible, uncontrolled movement of system piping or components, or parts of components. Test equipment should be examined before pressure is applied to ensure that it is tightly connected. All low-pressure filling lines and other items not subject to the test pressure should be disconnected or isolated.
- c. Water will be made available to the Contractor from nearby hydrants for flushing, filling, and testing the new piping prior to being placed in service. Operation of hydrants shall only be performed by Owner's personnel, and Contractor shall provide backflow preventer that is approved by the Owner when water is drawn from Owner's hydrants. No payment will be required for the use of Town water for this purpose. Any water used by the Contractor, not associated with the flushing, filling and testing of the new piping, shall be billed to the Contractor, and the cost of this additional water shall not be invoiced to the Owner.
- d. Test medium and test section temperatures shall be maintained below 100°F. At temperatures above this level, reduced test pressure is required. Before applying test pressure, time may be required for the test medium and test section to temperature equalize.
- e. Testing shall not be conducted until after trench backfill is completed and concrete thrust blocks have been allowed sufficient time to completely cure. All testing shall be conducted in the presence of the Engineer. Should the pipeline fail the test, the Contractor shall determine the cause of failure, replace the defective joints, fittings or pipes, and retest the pipeline, repeating the process until the test is passed at no additional costs to the Owner. The Contractor is responsible for all costs associated with remedies for a section of pipeline failing the pressure testing.

1.02 <u>SUBMITTALS</u>

a. Submit material specifications and shop drawings for all materials furnished under this section

PART 2 - PRODUCTS

2.01 EQUIPMENT

- a. The Contractor shall furnish all equipment and personnel required to conduct each of the acceptance tests as described under Part 3 of this section. The Contractor shall determine appropriate lengths for test sections. Test equipment of proper capacity shall be provided by the Contractor.
- b. The Contractor shall furnish labor, equipment, gauges, air, and all else necessary for carrying out the testing of all piping. All piping, fittings, caps, and plugs shall be adequately braced and anchored to withstand the test pressures. The Contractor shall review the Contract Drawings before starting piping installation and shall take special note of where piping begins or terminates with fittings which will be difficult or impractical to seal, plug and anchor. For these cases, the Contractor shall devise and perform such tests as shall be acceptable and approved by the Engineer and as shall demonstrate that the piping meets the test pressures and leakage requirements specified herein.

PART 3 - EXECUTION

3.01 <u>VERTICAL DEFLECTION TEST OF GRAVITY SEWERS AND STORM DRAINAGE</u> <u>SYSTEMS</u>

- a. The Contractor shall furnish all equipment and personnel to conduct deflection testing on all PVC and HDPE pipe installed. The total vertical wall deflection of the PVC and HDPE pipe shall not exceed five (5) percent of the inside pipe diameter. Deflection testing shall not be conducted earlier than thirty (30) days after placement and compaction of the backfill.
- b. The vertical deflection shall be checked by manually pulling a go, no-go deflection testing mandrel through the pipe. The mandrel shall be specifically designed for this purpose, and the Contractor shall submit shop drawings to the Engineer detailing the type of mandrel to be used. The mandrel shall be as manufactured by Armco, Inc. or equal and shall have the specified accuracy in all positions of rotations.
- c. The Contractor shall conduct all deflection testing in the presence of the Engineer. Should any pipe section exceed the maximum deflection specified, the Contractor shall undertake any remedial action as required to reduce the deflection to within that limit.

3.02 <u>TV INSPECTION OF GRAVITY SEWERS</u>

- a. All television inspections shall be performed by personnel experienced and trained in locating breaks, obstructions, service connection laterals, etc. in sewer lines by closed circuit television. The Contractor shall submit an equipment and personnel experience list to the Engineer for approval prior to commencement of the work. Picture quality and definition of all video equipment and recordings shall be to the complete satisfaction of the Engineer. CCTV equipment shall include all equipment necessary for satisfactory televising and recording. Any recordings deemed unsatisfactory by the Engineer shall be redone at the Contractor's expense until a satisfactory recording is produced.
- b. The Contractor shall furnish all equipment for video tape recording and for taking photographs of the pictures observed on the monitor. All sewer inspections shall be recorded for future reference.

- c. All CCTV inspections shall be conducted with no sewage flowing in the segment to be inspected. The Contractor shall first clean and flush all lines, and debris flushed out shall be removed at each downstream manhole. Where branch lines connect directly to the sewer being inspected without manholes, the inspection shall be performed during periods of low flow. Under no circumstance shall the depth of flow within the sewer being inspected exceed 5 percent of the sewer diameter.
- d. Any sewers that contain steam or vapors that may obscure the televised view of the sewer shall not be inspected with the steam or vapors in the sewer. When this situation arises, the Contractor shall use an air blower to ventilate the sewer line and improve visibility to an acceptable level as determined by the Engineer.
- e. The television inspection equipment shall be self-contained complete with manual or powered winches, cable, a flexible push rod for service connection laterals, closed circuit television pan and tilt camera, video tape recorder, camera, film, monitor, a measuring device to accurately determine the position of the camera at all times and all miscellaneous equipment required to perform a complete television inspection.
- f. The television camera shall be one specifically designed and constructed to perform closed circuit television sewer inspections. The camera shall be waterproof and capable of operating in 100 percent humidity conditions and shall have 360 degrees of rotation, 240 degrees of pan and tilt; lens sensitivity of 3 lux; remotely controlled focus and iris adjustment and auto centering realignment to axial viewing. The camera, television monitor and all components of the video system shall produce a minimum of 500-line resolution color video picture. Video recordings shall be made in VHS format at short play (SP) tape recording speed on T120 video cassettes of extra high grade. Lighting shall be head and camera mounted and of adequate intensity and coverage to produce a clear, well lit image of the entire sewer perimeter and length.
- g. Television inspection shall begin at the centerline of the upstream manhole of the sewer segment to be inspected and shall progress downstream to the centerline of the next manhole. If camera movement is obstructed in the downstream direction, the inspection shall be conducted from the centerline of the downstream manhole and progress upstream. If camera movement is still obstructed, the Contractor shall investigate and remove the source of obstruction and reinspect the line. Under no circumstances shall a line be rehabilitated which has not been CCTV inspected first.
- h. In addition to the sewer segments, upstream, intermediate and downstream manholes shall be television inspected to determine the condition of the walls, inverts, branch connections, benching, steps, etc.
- i. Manual winches, power winches, TV cable and power rewinds or other mechanical devices that do not interfere with proper documentation of the sewer condition, damage the sewer or obstruct the camera view shall be used to move the camera through the sewer line. If non-remotely controlled power winches are used to move the camera through the sewer line, radios or telephones shall be used to ensure adequate communication between crew members. The Contractor shall take the necessary precautions to protect the sewer line and manholes being inspected from damage by the winch cables or any other inspection equipment and shall repair any damage resulting from his operations at his expense.
- j. The camera shall be moved through the sewer line at a uniform rate, pausing for a minimum of 5 seconds at defects, service connections, etc. as necessary. The rate of camera movement shall not exceed 30 feet per minute. Measurement for the accurate location of features along the pipe alignment shall be provided and operated by the Contractor. The footage meter shall be mounted on the TV reel power level winding assembly. The meter shall be equipped

with a local mechanical readout for use at the rear of the TV vehicle and an electronic cable which is connected to the data view system for display on the video monitor and the video tape. The footage meter shall accurately record the distance in feet which the video cable has traveled. The measurement shall be accurate to 0.20 feet per 100 feet of inspected sewer length.

- k. The Contractor shall log the results of all observations and prepare all necessary data that may be required for record purposes. The inspection log shall include the following items as a minimum: inspection date; street location; segment reach (MH # to MH #); starting footage meter reading; condition of all manholes encountered; locations of all obstructions, service connections, branch connections, defects and other items of interest; and ending footage meter reading. The Contractor shall submit the inspection log format to be used throughout the Contract to the Engineer for approval prior to any inspection operations.
- 1. The Contractor shall describe on the video recording all features encountered while moving the camera from the center of the entry manhole to the distance in the pipe where he sets his footage meter. An audio recording of estimated footage shall be made for all features described prior to setting the footage meter. At the time of the inspection, the Contractor shall provide an audio description of all defects, joints, discharges, service connection laterals and other important features on the video recording. Where service lateral is to be reused, visually check and record (using camera) the condition of the lateral and verify true alignment and any points of damage. In case of misalignment, or extensive damage, applicant may be required to remove, re-lay, or replace the lateral while meeting a 10-feet water lateral separation. The date of the TV inspection, location (MH # to MH #) and the distance that the camera has traveled through a particular sewer reach shall be continuously displayed on the monitor and recorded cassette. All video cassettes obtained during the work shall be turned over to the Engineer and shall become property of the Owner.
- m. Two printed copies of the television inspection reports and inspection video with voice audio recordings shall be provided weekly during the course of the CCTV inspection activities.

3.03 LOW PRESSURE AIR TEST OF GRAVITY SEWERS

- a. Before final acceptance of the sewers, the Contractor shall furnish all equipment and personnel to conduct an acceptance test where practical using low pressure air.
- b. The Contractor shall first clean and flush all lines, and all debris flushed out shall be removed at each downstream manhole.
- c. All test plugs, gauges, an air compressor, and personnel for conducting the acceptance test shall be furnished by the Contractor. The test shall be conducted under the supervision of the Engineer.
- d. The section of line being tested shall be securely plugged at each manhole. All stoppers shall be adequately braced.
- e. For the acceptance test, air shall be slowly supplied to the plugged section of pipe to be tested until the internal air pressure reaches 4.0 psi greater than the average back pressure of any groundwater that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further. The back pressure of any groundwater caused by the water head above the invert of the pipe must be determined by a method approved by the Engineer. This back pressure must be added to the standard test pressures to compensate for the groundwater effect on the air test.

- f. The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 psi to 2.5 psi greater than the average back pressure of any groundwater that may submerge the pipe.
- g. The pipeline shall be considered acceptable when the 1.0 psi pressure drop is not less than the holding time listed in the air test included at the end of this section.
- h. If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of exfiltration, and shall repair or replace all defective materials or workmanship. The complete pipe installation shall meet the requirement of this test.

3.04 HYDROSTATIC PRESSURE TEST OF FORCE MAINS

- a. The Contractor shall test all sections and appurtenances of the force mains. The pressure shall be measured at the lowest part of the line and shall be either 100% higher than normal operating pressure or 150 psi if the former exceeds 150 psi. Conduct the test for a period of 4 hours or until the Engineer accepts the main.
- b. Test pressures shall be held continuously for 2 hours. The test reading shall be taken at the high point on the line or at a location approved by the Engineer. The Contractor shall be required to keep detailed records of all testing and all records shall be submitted to the Owner for review and record.
- c. All tests must be conducted in the presence of the Owner's representative. Any tests not witnessed by the Owner's representative shall be void and the Contractor shall be required to re-test that particular section in the presence of the Owner's representative at the Contractor's own expense.
- d. When segments of force main are completed and ready for testing, the line shall be thoroughly vented and a leakage test made with the line free of air. The leakage testing will not be permitted unless the pipeline is thoroughly vented of all air. All concrete thrust blocks shall be allowed sufficient time to cure before the commencement of testing.
- e. Leaks at joints or in the pipe and fittings shall be corrected by approved means and the piping retested in accordance with this specification until it successfully passes the tests.
- f. Under the foregoing conditions, the allowable leakage shall be determined by the following formula:



- L = Allowable Leakage, Gallons per hour
- S = Length of Pipe Tested, feet
- D = Nominal Pipe Diameter, inches
- P = Average Test Pressure, psi
- g. Joints that leak shall be repaired and retested under the same conditions and under the same period of operation. If joints are found to be defective, they shall be replaced until the line passed the required test at the Contractor's expense.
- h. All valves, plugs, fittings and appurtenances necessary to complete testing shall be included within the various unit prices bid throughout the Contract.

3.05 VACUUM TEST OF GRAVITY SEWER MANHOLES

- a. After a manhole has been constructed and prior to backfilling, conduct a manhole acceptance test using the following vacuum test procedure:
 - 1. Plug all lift holes with an approved non-shrink grout
 - 2. Plug pipe openings, and securely brace plugs and pipe
 - 3. Place the vacuum test head inside the access opening on top of the precast concrete section and inflate the seal in accordance with the manufacturers' recommendations.
 - 4. Draw vacuum to 10 inches of mercury, shut off the vacuum pump, and start the test.
 - 5. With the valves closed, measure the time for the vacuum to drop 1 inch of mercury.
 - 6. The manhole shall pass if the test duration is greater than:
 - 60 seconds for manholes less than 9 feet deep
 - 75 seconds for manholes between 9 feet and 14 feet deep
 - 90 seconds for manholes greater than 14 feet deep
- b. If vacuum test fails to meet 1 inch mercury drop in specified time, repair and retest manhole until a satisfactory test is obtained.

MINIMUM HOLDING TIME REQUIRED FOR PRESSURE TO DROP FROM 3-1/2 TO 2-1/2 PSIG FOR LOW-PRESSURE AIR TESTING OF INSTALLED SEWER PIPE

		3	4								
1	2	Length	Time								
Pipe	Minimum	for	For	Minimum Time for Length (L) Shown (min:sec)							
Dia-	Time	Minimum	Longer								
meter	(min:	Time	Length								
(in.)	sec)	(ft)	(sec)	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	2.16	507	200 1	2.46	2.46	2.46	2.46	0.46	2.46	2.46	2.46
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.845 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

REF: UNI-BELL PLASTIC PIPE ASSOCIATION, PUB. UNI-B-6-79 "RECOMMENDED PRACTICE FOR LOW-PRESSURE AIR TESTING OF INSTALLED SEWER PIPE"

END OF SECTION

SECTION 16050 BASIC ELECTRICAL REQUIREMENTS

PART 1 - <u>GENERAL</u>

1.1 <u>SECTION INCLUDES</u>

a. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.2 <u>SCOPE OF WORK</u>

- a. This scope covers the furnishing, installation, testing, adjusting and placing in operation all electrical equipment, devices, facilities, materials, and auxiliary items necessary for the complete and successful operation of all electrical equipment as herein described, shown on the plans, or deemed necessary for the completion of the electrical portion of the project. It is the intent of Division 16 to outline the electrical requirements of the contract in order to provide the information necessary for the construction of a fully operational system as shown on the plans and as herein described. A comprehensive electrical scope of work is as follows:
 - 1. Power/Electrical System
 - 2. Generator Systems
 - 3. Lighting System
 - 4. Utility Work
 - 5. Connection of Electrically Powered Mechanical Equipment
 - 6. Temporary Construction Power
 - 7. All Incidentals Necessary for a Complete and Fully Operational Electrical System.
 - 8. Controls

1.3 WORKING CLEARANCES

- a. Working clearances around equipment requiring electrical services shall be verified by Contractor to comply with Code requirements. Should there be apparent violations of clearances; the Contractor shall notify the Engineer before proceeding with connection or placing of equipment.
- b. In the case of panelboards, safety switches and other equipment requiring wire and cable terminations, the Contractor shall ascertain that lug sizes and wiring gutters or space allowed for proper accommodation and termination of the wires and cables are adequate.

1.4 WORKMANSHIP

a. Workmanship under this Division shall be accomplished by persons skilled in the performance of the required task. All work shall be done in keeping with conventions of the trade. Work of this Division shall be closely coordinated with work of other trades to avoid conflict and interference.

1.5 PROTECTION OF ELECTRICAL EQUIPMENT

a. Electrical equipment shall be protected by the weather, especially from water dripping or splashing upon it, at all times during shipment, storage and after installation. Should any apparatus be subjected to possible injury by water, it shall be thoroughly dried out and put through a dielectric test, at the expense of the Contractor, to ascertain the suitability of this apparatus. The results of the test shall be submitted to the Engineer and if the apparatus is found to be unsuitable, the Contractor shall replace it without additional cost to the Owner.

1.6 <u>UTILITIES</u>

- a. The electrical Contractor shall install a fully operational electrical service as described in the plans.
- b. Arrange with the utility company for the services and install the services in accordance with their requirements, regulations and recommendations.

1.7 <u>GUARANTEE</u>

- a. Contractor shall guarantee all light bulbs. Fluorescent and HID lamps, starters, and ballasts shall be guaranteed for a period of one (1) year after the building is occupied. Incandescent bulbs shall be guaranteed for a period of 30 days after occupancy. Guarantee shall include material and labor for re-lamping.
- b. The Contractor shall guarantee all other electrical systems, materials and workmanship to be free from defects for a period of one (1) year or otherwise stated from the date of final acceptance of Project. He shall correct all defects arising within this period upon notification by the Owner or Engineer, without additional compensation.
- c. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

1.8 <u>TEMPORARY POWER AND LIGHTS DURING CONSTRUCTION</u>

a. It shall be the responsibility of the Contractor to provide and maintain adequate temporary power and lighting at all times during construction, so that the various other trades can accomplish their work in a flawless manner. Particular attention will be given to power and lighting for masonry, drywall, painting, tile work and any other finish work.

1.9 <u>MATERIAL STANDARDS</u>

a. Material shall be new and comply with standards of Underwriters' Laboratories, Inc., where standards have been established for the particular product and the various NEMA, ANSI, ASTM, IEEE, AEIC, IPCEA or other publications referenced.

1.10 TEST EQUIPMENT

The Contractor shall provide all test equipment and supplies deemed necessary by the Engineer a. at no extra cost to the Owner. These supplies shall include but not be limited to the following: volt meters, amp meters, clamp-on ground rod test meter, light meters, generator load banks & temporary cables, watt meters, harmonic distortion test equipment, thermal image camera, megger tester, high pot test equipment, power quality analyzers, recording power meter, and oscilloscopes.

1.11 REFERENCES

- ANSI/NFPA 70 National Electrical Code. a.
- ANSIC2 National Electrical Safety Code. b.
- NEMA National Electrical Manufacturer's Assoc. c.
- d. UL – Underwriters Laboratories
- NFPA National Fire Protection Assoc. e.
- f. IEEE – The Institute of Electrical and Electronics Engineers
- IESNA The Illuminating Engineering Society of North America g.
- h. NETA – International Electrical Testing Association
- i. **API** – American Petroleum Institute
- j. AGA - American Gas Association

1.12 **SUBMITTALS**

- a. Submit under provisions of the General Provisions.
 - The Contractor installing all Electrical work shall review and approve all electrical shop 1. drawings prior to submittal to the Engineer for review. As part of the review, the installer shall certify the following:
 - I hereby certify that the (equipment) (material) (article) shown and marked in this a. submittal is in compliance with the contract drawing and specifications, can be installed in the allocated space, will be stored in accordance with the manufacturers recommendation, will be installed per NEC, and is submitted for approval.

Certified by: _____ Date: _____

- b. Submit shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal. No electrical work may be performed until shop drawings are approved. Submit Shop Drawings on the Following Systems as Grouped Below: 2.
 - Low Voltage Power/Electrical System
 - Conduit and Conduit Fittings a.
 - Wire b.

- c. Pull Boxes
- d. Panelboards
- e. Panelboard Layouts
- f. Circuit Breakers
- g. Disconnects
- h. Fuses
- i. Conduit Support Systems
- j. Wiring Devices
- k. Surge Protection Equipment
- 3. Generator Equipment
 - a. Generator
 - b. Fuel System
 - c. ATS Equipment
 - d. Generator Enclosure
 - e. Power Correction Equipment
- 4. Lighting System
 - a. All Light Fixtures
 - b. Poles & Foundations
- 5. Miscellaneous Electrical Equipment
 - a. Miscellaneous Electrical Parts
- 6. Drawings
 - a. Coordinate equipment layout in enclosure
 - b. Conduit layout drawings
 - c. As-Built Drawings
- c. Mark dimensions and values in units to match those specified.

1.13 <u>REGULATORY REQUIREMENTS</u>

- a. Conform to applicable sections of the Building Code and all local rules, regulations and ordinances.
- b. Electrical: Conform to NFPA 70 & National Electric Safety Code
- c. Obtain permits, and request inspections from authority having jurisdiction.
- d. References listed in Paragraph 1.11, this section.

1.14 FINAL INSPECTION AND TESTING

- a. After the electrical installation is complete, the Contractor shall deliver to the Engineer the following information with his request for final inspection.
 - 1. One set of contract drawings marked to show all significant changes in equipment ratings and locations, alterations in locations of conduit runs, or of any data differing from the contract drawings. This shall include revised or changed panelboard and switchgear schedules.
 - 2. Certificates of final inspection from local authority.
 - 3. A tabulation of all motors listing their respective manufacturer, horsepower, nameplate voltage and current, actual running current after installation and overload heater rating.
- b. The electrical work shall be thoroughly tested to demonstrate that the entire system is in proper working order and in accordance with the plans and specifications. Each motor with its control shall be run as nearly as possible under operating conditions for a sufficient length of time to

demonstrate correct alignment, wiring capacity, speed and satisfactory operation. All main switches and circuit breakers shall be operated, but not necessarily at full load. Contractor may be required during final inspection, at the request of the Engineer to furnish test instruments for use during the testing.

c. All wiring shall be given a megger test using a 1000 Volt megger. This test shall be performed after conductors are pulled, but before final connections are made. The Engineer shall be given two (2) days' written notice of the anticipated test date so that he may witness the test if so desired. In any event, the Contractor shall record the circuit designation and the megger reading on each phase. This written record shall be submitted to the Engineer. The cost of this test or any retest caused by insufficient megger readings shall be the responsibility of the Contractor (All tests shall be done in accordance with NETA Standards).

1.15 <u>AS-BUILT DRAWINGS</u>

- a. The Contractor shall provide detailed as-built drawings for the project indicating all power wiring. (All Drawings shall be delivered to the Owner in an AutoCAD Format same version as the CD containing the bid set.)
- b. The As-Built drawings shall include detailed drawings of all underground conduit, above ground conduit, PLC control panels, control drawings. These drawings shall indicate exact location of all underground electrical wiring.
 - 1. The location shall indicate the following
 - a. Centerline location
 - b. Width / Cross section
 - c. Depth
- c. The Engineer will provide electronic copies of all drawings in the bid plans set on a CD for use by the Contractor.

END OF SECTION

<u>SECTION 16060</u> GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - <u>GENERAL</u>

1.1 <u>RELATED DOCUMENTS</u>

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- b. For definitions of grounding and bonding terms see NFPA 70.

1.2 <u>SUMMARY</u>

- a. Section includes grounding and bonding systems and equipment.
 - 1. Underground distribution grounding.
 - 2. Foundation steel electrodes.

1.3 <u>ACTION SUBMITTALS</u>

a. Submit product data, material specifications, and shop drawings for all products and materials furnished under this section.

1.4 INFORMATIONAL SUBMITTALS

- a. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Ground rods.
 - 2. Ground rings.
 - 3. Grounding arrangements and connections for separately derived systems.
- b. Field quality-control reports.

1.5 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. Instructions for periodic testing and inspection of grounding features at ground rings, grounding connections for separately derived systems based on NETA MTS

- 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
- 2) Include recommended testing intervals.

1.6 **QUALITY ASSURANCE**

- a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- b. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - <u>PRODUCTS</u>

2.1 <u>MANUFACTURERS</u>

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. ERICO International Corporation.
 - 3. Harger Lightning and Grounding.
 - 4. ILSCO.
 - 5. O-Z/Gedney; A Brand of the EGS Electrical Group.
 - 6. Robbins Lightning, Inc.
 - 7. Siemens Power Transmission & Distribution, Inc
 - 8. Or equal

2.2 <u>SYSTEM DESCRIPTION</u>

- a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- b. Comply with UL 467 for grounding and bonding materials and equipment.
- c. Grounding electrode system shall not exceed 5 ohms.

2.3 <u>CONDUCTORS</u>

- a. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- b. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
c. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 <u>CONNECTORS</u>

- a. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- b. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- c. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- d. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 <u>GROUNDING ELECTRODES</u>

a. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) minimum.

PART 3 - EXECUTION

3.1 <u>APPLICATIONS</u>

- a. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6AWG and larger unless otherwise indicated.
- b. Underground Grounding Conductors: Install bare copper conductor, No. 1/0 AWG minimum.
 - 1. Bury at least 24 inches (600 mm) below grade.
- c. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- d. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 **GROUNDING AT THE SERVICE**

a. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 <u>GROUNDING SEPARATELY DERIVED SYSTEMS</u>

a. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 EQUIPMENT GROUNDING

- a. Install insulated equipment grounding conductors with all feeders and branch circuits.
- b. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- c. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare copper, not less than No. 8AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.

3.5 <u>INSTALLATION</u>

- a. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- b. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. When service grounding is not detailed on the drawings, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- c. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.6 <u>FIELD QUALITY CONTROL</u>

- a. Perform tests and inspections.
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81 and NETA Standards.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- b. Grounding system will be considered defective if it does not pass tests and inspections.
- c. Prepare test and inspection reports.
- d. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: **5**ohms.
- e. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 16070 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - <u>GENERAL</u>

1.1 <u>RELATED DOCUMENTS</u>

a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 <u>SUMMARY</u>

- a. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- b. Related Sections include the following:

1.3 <u>DEFINITIONS</u>

- a. EMT: Electrical metallic tubing.
- b. IMC: Intermediate metal conduit.
- c. RMC: Rigid metal conduit.

1.4 **PERFORMANCE REQUIREMENTS**

- a. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified Professional Engineer, using performance requirements and design criteria indicated.
- b. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- c. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- d. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 <u>SUBMITTALS</u>

a. Product Data: For the following:

- 1. Steel slotted support systems.
- 2. Nonmetallic slotted support systems.
- b. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Steel slotted channel systems. Include Product Data for components.
 - 2. Nonmetallic slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

a. Welding certificates.

1.7 **QUALITY ASSURANCE**

- a. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- b. Comply with NFPA 70.

1.8 <u>COORDINATION</u>

a. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - <u>PRODUCTS</u>

2.1 <u>SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS</u>

- a. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. <u>Wesanco, Inc</u>.
 - h. or Equal
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

- 4. Channel Dimensions: Selected for applicable load criteria.
- b. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- c. Conduit and Cable Support Devices shall be as indicated below:
 - 1. PVC Conduit PVC, Fiberglass, or Stainless Steel (unless atmosphere is corrosive to Stainless Steel)
 - 2. RGS Conduit Galvanized Steel
 - 3. Aluminum Conduit Stainless Steel
 - 4. PVC Coated RGS Stainless Steel (unless atmosphere is corrosive to Stainless Steel); if atmosphere is corrosive to Stainless Steel then use Fiberglass
 - 5. EMT Painted or Galvanized Steel
- d. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- e. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- f. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 - 5) or Equal
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - b. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

- 5) MKT Fastening, LLC.
- 6) or Equal
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

a. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 <u>APPLICATION</u>

- a. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- b. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- c. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps].

3.2 <u>SUPPORT INSTALLATION</u>

- a. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- b. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- c. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.

- 2. To New Concrete: Bolt to concrete inserts.
- 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
- 4. To Existing Concrete: Expansion anchor fasteners.
- 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
- 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
- 7. To Light Steel: Sheet metal screws.
- 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- d. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- a. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- b. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 <u>CONCRETE BASES</u>

- a. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- b. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified in the contract documents.
- c. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 <u>PAINTING</u>

- a. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

b. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 16075 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - <u>GENERAL</u>

1.1 <u>RELATED DOCUMENTS</u>

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

1.2 <u>SUMMARY</u>

- a. This Section includes the following:
 - 1. Identification for raceway and metal-clad cable.
 - 2. Identification for conductors and communication and control cable.
 - 3. Underground-line warning tape.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.

1.3 <u>SUBMITTALS</u>

- a. Product Data: For each electrical identification product indicated.
- c. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- d. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 **QUALITY ASSURANCE**

- a. Comply with ANSI A13.1, ANSI C2, and ANSI Z635.4.
- b. Comply with NFPA 70.
- c. Comply with 29 CFR 1910.145.

1.5 <u>COORDINATION</u>

a. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and

Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

- b. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- c. Coordinate installation of identifying devices with location of access panels and doors.
- d. Install all signs and labels horizontal (level) and consistent for similar equipment and panels.

PART 2 - <u>PRODUCTS</u>

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- a. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- c. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- d. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- e. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

a. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- a. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb, minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- b. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

PART 3 - EXECUTION

3.1 <u>APPLICATION</u>

- a. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with snap-around label.
 - i. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- b. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
 - i. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
 - ii. Mechanical and Electrical Supervisory System: Green and blue.
 - iii. Telecommunication System: Green and yellow.
 - iv. Control Wiring: Green and red.
- c. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and hand holes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
 - i. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.
- d. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
 - i. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- e. Conductor Color Code Identification: Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a given branch circuit shall be identified by color coded tape or cable insulation at all termination, connection or splice points.
- f. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
 - i. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
 - ii. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- g. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, and data connections.
 - i. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

- ii. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- iii. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- iv. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- h. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway. During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches above duct. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
 - i. Description:
 - 1. Permanent, bright-colored, continuous-printed, polyethylene tape.
 - 2. Not less than 6 inches wide by 4 mils thick.
 - 3. Compounded for permanent direct-burial service.
 - 4. Embedded continuous metallic strip or core.
 - 5. Printed legend shall indicate type of underground line.
- i. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - i. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - 1. Power transfer switches.
 - 2. Controls with external control power connections. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
 - ii. Comply with NFPA 70 and 29 CFR 1910.145.
 - iii. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
 - iv. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
 - v. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
 - vi. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
- j. Instruction Signs:
 - i. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs

with Engineer/Owner APPROVED instructions where needed for system or equipment operation. Instructions are needed for all equipment unless otherwise noted.

- 1. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16inch-thick for signs up to 20 sq. in. and 1/8-inch-thick for larger sizes.
- 2. The engraved legend shall be $\frac{1}{2}$ "White letters on Brown face and punched or drilled for mechanical fasteners.
- 3. The signs shall be installed with stainless hardware.
- ii. Emergency Operating Instructions: Install emergency operating instruction signs at equipment used for power transfer, safety shutdown, or any other locations requiring operation in an emergency.
 - 1. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16inch-thick for signs up to 20 sq. in. and 1/8-inch-thick for larger sizes.
 - 2. The engraved legend shall be ¹/₂ "White letters on Red face and punched or drilled for mechanical fasteners.
 - 3. The signs shall be installed with stainless hardware.
- k. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - i. Labeling Instructions:
 - 1. Indoor and Outdoor Equipment: Use engraved, laminated acrylic or melamine labels, punched or drilled for screw mounting. Identification labels shall have white letters on a dark-gray background. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high. Mount labels with stainless hardware.
 - 2. Elevated Components : Increase the size of the labels and letters to those appropriate for viewing from the floor.
 - ii. Equipment to Be Labeled:
 - 1. Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
 - 2. Panelboards, electrical cabinets, and enclosures.
 - 3. Access doors and panels for concealed electrical items.
 - 4. Emergency system boxes and enclosures.
 - 5. Disconnect switches.
 - 6. Enclosed circuit breakers.
 - 7. Motor starters.
 - 8. Push-button stations.
 - 9. Power transfer equipment.
 - 10. Contactors.
 - 11. Power-generating units.
 - 12. Monitoring and control equipment.
 - 13. Control systems
 - 14. Field mounted control devices
 - 15. Field mounted instruments

3.2 INSTALLATION PRACTICES

- a. Verify identity of each item before installing identification products.
- b. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- c. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- d. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - 1. Color shall be factory applied or, for sizes LARGER than No. 10 AWG if authorities having jurisdiction permit, field applied.
 - 2. Colors for 240/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
 - 4. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, the color codes used to identify each phase, neutral (if applicable) and ground conductor throughout the system shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. Provide factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- e. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- f. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION

SECTION 16120 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 <u>RELATED DOCUMENTS</u>

a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- b. Related Requirements:
 - 3. Division 16.

1.3 <u>ACTION SUBMITTALS</u>

a. Submit product data, material specifications, and shop drawings for all products and materials furnished under this section.

1.4 INFORMATIONAL SUBMITTALS

- a. Qualification Data: For testing agency.
- c. Field quality-control reports.
- d. Standard Test Record Sheet/s.

PART 2 - <u>PRODUCTS</u>

2.1 <u>CONDUCTORS AND CABLES</u>

- a. Manufacturers: Subject to compliance with requirements provide products by one of the following:
 - 1. Alpha Wire.
 - 2. Belden Inc.
 - 3. Encore Wire Corporation.
 - 4. General Cable Technologies Corporation.
 - 5. Southwire Incorporated.
 - 6. Or Equal

- b. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Unless specifically shown on the plans as Aluminum.
- c. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, RHW-2 Low Smoke, SOW and Type SO.
- d. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC, Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Gardner Bender.
 - 3. Hubbell Power Systems, Inc.
 - 4. Ideal Industries, Inc.
 - 5. Ilsco; a branch of Bardes Corporation.
 - 6. NSi Industries LLC.
 - 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 - 8. 3M; Electrical Markets Division.
 - 9. Tyco Electronics.
 - 10. Or Equal
- b. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 INSTRUMENTATION CABLE

- a. Electronic transmission shall be via stranded, shielded, twisted conductors of not less than 18 AWG conductor wire. All termination points shall have terminal lugs. Instruments and panels shall be grounded to the nearest plant equipment ground. Shielded cable shall have the shield grounded at one point for each loop; preferably at the point of origin. Signal wires shall not be run in conduit containing wire used for any other purpose.
- b. The 4-20 mA, signal cable shall be 18-gauge, 600VC rated, twisted shielded single pair copper stranded conductors with teflon insulation. The pair shall have a minimum lay of 2 inches per twist. The shield shall be aluminum-polyester with a 20 AWG stranded tinned copper drain wire and an overall Teflon jacket rated at 600 volts. Color code shall be red and black. Cable shall be suitable for plenum, conduit and submerged service. Cable shall be equal to Belden No. 9342, Houston HW105 Series or Alpha #5440/2.

2.4 <u>SYSTEM DESCRIPTION</u>

- c. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 <u>CONDUCTOR MATERIAL APPLICATIONS</u>

- a. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- b. General Branch Circuits in building for lighting and receptacles: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger, except VFD cable, which shall be extra flexible stranded.

3.2 <u>CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND</u> <u>WIRING METHODS</u>

- a. Industrial Facilities, including Water / Waste Water
 - 1. Service Entrance: Type XHHW-2, single conductors in raceway.
 - 2. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
 - 3. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
 - 4. Class 1 Control Circuits: Type XHHW-2, in raceway.
 - 5. Class 2 Control Circuits: Type XHHW-2, in raceway

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- a. Complete raceway installation between conductor and cable termination points according to Division 16 prior to pulling conductors and cables.
- b. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- c. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- d. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- e. Support cables according to Section 16070 "Hangers and Supports for Electrical Systems."

3.4 <u>CONNECTIONS</u>

a. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. All torque tighting equipment shall be calibrated before use with calibration records available for inspection.

- b. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- c. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 <u>IDENTIFICATION</u>

- a. Identify and color-code conductors and cables according to Section 16075 "Identification for Electrical Systems."
- b. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 <u>SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS</u>

a. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.7 <u>FIRESTOPPING</u>

a. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to the project specifications.

3.8 FIELD QUALITY CONTROL

- a. Perform the following tests and inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Record all results and submit to Engineer for approval. Certify compliance with manufacturer's test parameters, in the absence of Manufacturer's published data, certify compliance with the table listed in NETA Acceptance Testing Specification.
 - 2. All testing must be carried out by a competent person.
 - 3. NETA Acceptance Testing Specification is the minimum level of testing that will be required on all projects with the most relevant inspection and test procedures extracted as listed below. The following list includes additional tests that will be required unless stated otherwise.

Pre-connection:

- a. Visual and Mechanical inspection.
- b. Perform resistance measurements through bolted connections with a low resistance DC Ohmmeter or an insulation resistance test meter.
- c. Continuity of all protective conductors to be recorded using a low resistance DC Ohmmeter or an insulation resistance test meter.
- d. Check continuity of all conductors and verify correct cable connections.
- e. Check polarity of all conductors.

- f. Perform insulation-resistance test on each conductor with respect to ground and all adjacent conductors using an insulation resistance test meter. Each conductor must be tested for 1 minute.
- g. Verify uniform resistance of all parallel conductors.

Post-connection

- h. Test and record the impedance at the supply origin.
- i. Test and record the Ground fault loop impedance between all live conductors and ground at the furthest extents of each final circuit. This test is to be completed using a Fault Loop Impedance tester and all results must be in compliance with the Circuit Protective Device (CPD) limits from the Manufacturer.
- j. Test and record the operating trip time of all GFI and GFCI's devices to ensure compliance with NEC and Manufacturer's published data. This test is to be completed using a GFCI test meter.
- k. Other functional testing may be listed here if required.
- 4. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- b. Test and Inspection Reports: Prepare a written report to record the following:
 - 5. Procedures used.
 - 6. List of test personal with Resumes.
 - 7. Summit all test results on the enclosed test form, see Appendix A.
 - 8. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- d. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

Appendix A.



TEST RECORD SHEET

SHEET NUMBER

CLIENT NAM	1F·																		
CATEGORY (Industrial, Commercial, Resid	ential, Oth	ner)				TYPE OF	INSTALLATIO	DN: NEW		REHAB	\Box	EXISTIN	IG 🔛	TEMP.		OTHER		
RESTRICTIO	NS (EQUIPMENT VULNERABLE	TO TESTIN	NG):																
		· · · · ·		· · · · ·				1						1	1				
			Cable			Overc	urrent	Continuity	All	Ø(A)	Ø(B)	Ø(C)	N To		L-Gnd	Functiona	al Testing	Comments	
Circuit Label	Circuit Designation	Туре	Size	Gnd. Size	No. of Points	Туре	Rating (Amps)	of Ground Conductor s (Ω)	Lives to Ground (Μ Ω)	to All Lives (Μ Ω)	to All Lives (Μ Ω)	to All Lives (ΜΩ)	All Phases (Μ Ω)	Polarity	Ground Fault Loop Impedance (Ohms)	GFCI Trip Time (ms)	Other		
Deviations f	rom Code or Specifications:												1						
DISTRIBUTION BOARD							ELECTRICITY SUPPLY						TESTERS/INSTRUMENTS						
LOCATION:					VOLTAG					TYPE			BRAND	MODEL	CALIBRATION DATE				
DISTRIBUTION BOARD REFERENCE:						EREQUENCY						INSULA	TION						
MAIN PROT						NO. OF PHASES:						CONTIN	ITY						
SUPPLY CAB	LE TO DB: TYPE:						PFC (kA):						LOOP I	MPEDANO	E				
RATING (A):							IMP. AT	ORIGIN (Ω):					GFCI TE	STER					
SIZE:													OTHER						
																	1		
PRE-COMM	ISSIONING TESTING COMPLET	ED BY (BLO	OCK LETT	ERS)						SIGNAT	URE:					DATE OF 1	resting:		
POST-COMM	DST-COMMISSIONING TESTING COMPLETED BY (BLOCK LETTERS)								SIGNATURE:]	DATE OF TESTING:			

LOW-VOLTAGE ELECTRICAL

SECTION 16130 RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 <u>RELATED DOCUMENTS</u>

a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Boxes, enclosures, and cabinets.
 - 5. Handholes and boxes for exterior underground cabling.
 - 6. Explosion proof equipment.

1.3 <u>DEFINITIONS</u>

- a. ARC: Aluminum rigid conduit.
- b. GRC: Galvanized rigid steel conduit.
- c. IMC: Intermediate metal conduit.

1.4 <u>ACTION SUBMITTALS</u>

- a. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- b. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- a. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. Plumbing items and architectural features in paths of conduit groups with common supports.

- b. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, include those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- c. Source quality-control reports.

PART 2 - <u>PRODUCTS</u>

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney.
 - 6. Picoma Industries.
 - 7. Republic Conduit.
 - 8. Robroy Industries.
 - 9. Southwire Company.
 - 10. Thomas & Betts Corporation.
 - 11. Western Tube and Conduit Corporation.
 - 12. Wheatland Tube Company.
 - 13. Or Equal.
- b. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- c. GRC: Comply with ANSI C80.1 and UL 6.
- e. ARC: Comply with ANSI C80.5 and UL 6A.
- f. IMC: Comply with ANSI C80.6 and UL 1242.
- g. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- h. FMC: Comply with UL 1; zinc-coated steel or aluminum.

- i. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- j. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- 1. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. AFC Cable Systems, Inc.
- 2. Anamet Electrical, Inc.
- 3. Arnco Corporation.
- 4. CANTEX Inc.
- 5. CertainTeed Corporation.
- 6. Condux International, Inc.
- 7. Electri-Flex Company.
- 8. Kraloy.
- 9. Carlon Electrical Products.
- 10. Niedax-Kleinhuis USA, Inc.
- 11. RACO; Hubbell.
- 12. Thomas & Betts Corporation.
- 13. Or Equal.
- b. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. ENT: Comply with NEMA TC 13 and UL 1653.
- e. RNC: Type EPC-40-PVC, or EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- f. LFNC: Comply with UL 1660.
- h. Rigid HDPE: Comply with UL 651A.
- i. Continuous HDPE: Comply with UL 651B.
- j. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

- k. RTRC: Comply with UL 1684A and NEMA TC 14.
- 1. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- m. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Mono-Systems, Inc.
 - 4. Square D.
 - 5. Or Equal.
- b. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 for interior or Type 4X stainless steel for exterior unless otherwise indicated, and sized according to NFPA 70.
 - 6. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- c. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- d. Wireway Covers: Hinged type for NEMA 1 and hinged, flanged-and-gasketed type for NEMA 4X unless otherwise indicated.
- e. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Moulded Products, Inc.
 - 2. Hoffman.
 - 3. Carlon Electrical Products.
 - 4. Niedax-Kleinhuis USA, Inc.
 - 5. Or Equal.
- b. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. Description: Fiberglass polyester or PVC, extruded and fabricated to required size and shape, and having hinged cover with captive screws.

e. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Adalet.
 - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman.
 - 7. Hubbell Incorporated.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. Mono-Systems, Inc.
 - 11. O-Z/Gedney.
 - 12. RACO; Hubbell.
 - 13. Robroy Industries.
 - 14. Spring City Electrical Manufacturing Company.
 - 15. Stahlin Non-Metallic Enclosures.
 - 16. Thomas & Betts Corporation.
 - 17. Wiremold / Legrand.
 - 18. Or Equal.
- b. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- c. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- d. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum to match raceway type, Type FD, with gasketed cover.
- e. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- f. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- g. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- h. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover, unless otherwise noted.
- i. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep), unless otherwise noted.
- j. Gangable boxes are prohibited, unless specifically noted.

- k. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- l. Cabinets:
 - 1. NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- m. Explosion Proof Enclosures: Comply with UL 1023, UL 886, and NFPA 70.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- a. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- b. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Oldcastle Precast, Inc.
 - e. Quazite: Hubbell Power System, Inc.
 - f. Synertech Moulded Products.
 - g. Or Equal.
 - 2. Standard: Comply with SCTE 77.
 - 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

- 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
- 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- 6. Cover Legend: Molded lettering, as required to identify system indicated on the drawings.
- 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
- 8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- c. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass unless otherwise noted.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Nordic Fiberglass, Inc.
 - e. Oldcastle Precast, Inc; Christy Concrete Products.
 - f. Quazite: Hubbell Power System, Inc; Hubbell Power Systems.
 - g. Synertech Moulded Products.
 - h. Or Equal.
 - 2. Standard: Comply with SCTE 77.
 - 3. Color of Frame and Cover: Gray.
 - 4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 - 5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 - 6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 7. Cover Legend: Molded lettering, as required to identify system indicated on the drawings
 - 8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 - 9. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- a. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by an independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered Professional Engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- a. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC, unless otherwise indicated on drawings.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC when concrete encased, Type EPC-80-PVC when direct buried,
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC unless otherwise indicated on drawings
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X Stainless steel unless otherwise indicated on drawings.
- b. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- c. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- d. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- e. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- f. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- a. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- b. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- c. Complete raceway installation before starting conductor installation.

- d. Comply with requirements in Section 16070 "Hangers and Supports for Electrical Systems" for hangers and supports.
- e. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- f. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- g. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- h. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 3 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.
 - 5. Change from ENT to GRC before rising above floor.
- i. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- j. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- k. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- 1. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- m. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- n. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- o. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- p. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

- q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- r. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- s. Expansion-Joint Fittings:
 - 1. Provide expansion joint fitting any time conduit systems cross building expansion joints or structural expansion joints.
 - 2. Provide expansion fittings as recommended by the manufacturer of the conduit.
 - 3. Provide expansion fittings per NFPA 70.
 - 4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- t. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- u. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- v. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- a. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit.
 - 2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction per 95% modified proctor density.
 - 3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor. Wrap conduit with 2 coats of 3M Scotch Wrap or Equal.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.

- b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
- 4. Underground Warning Tape: Comply with requirements in Section 16075 "Identification for Electrical Systems."

3.4 <u>SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS</u>

a. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.5 <u>FIRESTOPPING</u>

a. Install firestopping at penetrations of fire-rated floor and wall assemblies. Provide fire rated penetrations based on the fire proofing material being supplied. All penetrations through fire rated walls shall be fire proofed.

3.6 <u>PROTECTION</u>

- a. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 16135 ELECTRICAL ENCLOSURES

PART 1 - GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. Design, Supply and Install all hardware and software products required to provide a complete and fully functional control system as shown on the Drawings and/or herein specified.
- b. Layout the electrical enclosure and field wiring interfaces required to implement the control equipment.
 - 1. All components shall be UL recognized.
- c. Furnish, Install and Test:
 - 1. Control panels, enclosures and appurtenant equipment.
 - 2. Software products, interface cables and related products.
- d. Connect and test all input and output field wiring to and from the control equipment.
- e. Provide all manufacturer's services required for installation, startup, calibration, inspection, and training.

1.02 <u>WARRANTY</u>

- a. Conform to all Contract Warranty requirements specified in the General Conditions and General Requirements.
- b. Provide an extended manufacturer's warranty on all products and equipment to remain in effect for not less than one year after the successful completion of the reliability acceptance tests.

1.03 CONTRACTOR RESPONSIBILITIES

a. The contractor shall retain the services of a qualified system integrator to assist in the selection of equipment, preparation of submittals, installation, configuration and startup of all electrical enclosures.

1.04 <u>SUBMITTALS</u>

- a. Submit catalog cuts, shop drawings, and O&M manuals for all equipment in conformance with the requirements of Section 01330, Submittal Procedures.
 - 1. All control equipment hardware, and control panel shop drawings shall be reviewed and approved by the System Integrator prior to submission to the Engineer.

- b. Submit the following information involving proposed hardware for the control system:
 - 1. Shop drawings and catalog cuts for all panels and enclosures.
- c. Submit complete detailed shop drawings, working drawings and descriptive literature for control panel equipment, cabinets, and components. As a minimum the shop drawings and working drawings shall include the following:
 - 1. Bill of Materials
 - 2. Heat rise calculation of each enclosure.
 - 3. Front panel, back panel and panel schematic wiring diagrams.
 - a) Submit detailed drawings showing proposed arrangement of equipment within each enclosure, proposed locations of all equipment and enclosures, and proposed arrangement of all conduits and conductors that will enter each enclosure.
 - 1) This shall include components from other sections that will be placed on or in the panels. Consult drawings for details.
 - 4. Interconnection wiring diagrams showing all component and panel terminal board identification numbers and external wire numbers, including existing equipment and equipment furnished by others.
 - a) Refer to the drawings for additional information regarding the level of detail required for the wiring diagrams.
 - 5. Provide field wiring diagrams showing the connection of the wiring out to all new and existing monitored and controlled field devices. Field wiring diagrams include:
 - a) Point-to-Point Field Interconnection Diagrams.

PART 2 - PRODUCTS

2.01 EQUIPMENT ENCLOSURES

- a. Free Standing Enclosures (Pump Station 1 and 2)
 - 1. Provide a stainless steel NEMA 4X stainless steel equipment enclosure of 72" by 72" by 48" manufactured by Hoffman or equal with the following features:
 - a) Front and back access.
 - b) Center back plane.
 - c) 3 point latches on doors.
 - d) Pad lockable handle.
 - e) Appropriately sized heater unit for all enclosed equipment. Provide heating calculations in submittal.
 - f) Appropriately sized AC unit for all enclosed equipment. Provide cooling calculations in submittal.
 - g) Internal light on both sides with a switch that turns it on when door is opened.
 - h) Free standing

2.02 EQUIPMENT

- a. Electric Heater Enclosure:
 - 1. Wall mounted, integral thermostat fan forced heater, NEMA 1 enclosure.
 - 2. Rating: 1,000-watt, 240-volt, single phase. Heating element shall be non-glowing, 80/20 nickel-cadmium.
 - 3. Control on/off switch, bi-metallic fan control, thermostat 40-85-degree F, thermal cut-out with manual reset.
 - 4. Surface mount frame shall be heavy gauge steel to mount around backbox.
 - 5. Manufacturer: Marley QMark CWH202DSF (fan forced wall heater) or Equal.
- b. Explosion Proof Electric Heater Valve Chamber:
 - 1. Slope cabinet top.
 - 2. Element: Grade A nickel chromium heating coils insulated with ceramic and magnesium oxide from the copper heater tube fitted with large aluminum fins locked in place.
 - 3. Cabinet: Heavy gauge galvanized steel painted with a beige powder coat for durability.
 - 4. Factory furnished wall brackets.
 - 5. Thermal protection: A linear limit automatic reset thermal cutout built into the heater.
 - 6. Rating: 500-watt, 120/277 volt
 - 7. Environment: Class 1 Div. 1, 2, Group B, C, and D
 - 8. Manufacturer: Indeeco Convector or Equal
 - 9. Internal thermostat: Heavy-duty explosion-proof thermostat, 22-ampo @ 120/277-volt. Double pole, double throw, snap switch operation. Heat, cool, or heat/cool compatible. Temperature range shall be 50-90 degree F (10-32 degree C). Provide temperature adjustment knob with dual temperature scale. UL Class 1, Group C, D locations. NEMA 7, Div. 1 approved.
- c. Auto dialer:
 - 1. Description and phone number dialing: The dialer shall be a solid-state component capable of dialing up to 16 telephone numbers, each up to 60 digits in length. Phone numbers and Standard pulse dialing or Touch Tone® DTMF dialing are user programmable via the system's keyboard or remotely via Touch Tone telephone. In addition, the dialer shall:
 - a) Group alarm calls On alarm, system shall selectively call the correct phone number according to the specific alarm(s).
 - b) Detect telephone line fault and indicate condition with front panel LED.
 - c) Automatically select tone versus pulse dialing.
- d) Monitor call progress detect busy and ringing signals, abandon call if busy, wait until phone is answered to annunciate voice reports.
- e) Provide numeric pager support.
- f) Provide PBX support.
- 2. Solid state voice message recording and playback: The unit shall have two different categories of speech message capability, all implemented with permanent non-volatile solid-state circuitry with no mechanical mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front.
 - a) User field recorded messages: The user may record and re-record his own voice messages for each input channel and for the Station ID.
 - 1) There shall be no limit on the length of any particular message within the overall available message recording time, which shall vary from 26 to 635 seconds, depending upon the number of input channels selected, and the recording rate used.
 - 2) The unit shall allow selective recording of both normal and alarm advisory messages for each input channel.
 - 3) The unit shall provide for automatic setting of the optimum speech recording rate for the total set of messages recorder, in order to achieve optimum recording sound quality.
 - 4) Circuit board switches or jumper straps shall not be an acceptable means of manipulating message length or recording rates.
 - 5) Permanent built-in messages shall be included to support user programming operations, to provide supplemental warning messages such as advising that the alarms have been disabled, and to allow the unit to be fully functional even when the installer has not recorded any messages of his own
- 3. Input monitoring function: The basic unit shall continuously monitor the presence of AC power and the status of four (4) contact closure inputs. ac power failure, or violation of the alarm criteria at any input shall cause the unit to go into alarm status and begin dial-outs. the unit shall, upon a single program entry, automatically accept all input states as the normal non-alarm state, eliminating possible confusion about normal open versus normally closed inputs. further, as a diagnostic aid, unit shall have the capability of directly announcing the state of any given input as currently "closed circuit" or "open circuit" without disturbing any message programming. each input channel shall also be independently programmable, without the need to manipulate circuit board switches or jumpers, to any of the following:
 - a) Normally Open, Normally Closed, or for No Alarm (Status Only).
 - b) Run Time Meter to accumulate and report the number of hours a particular input circuit has been closed. Any channel so configured will never cause an alarm call; rather, on inquiry it will recite its message according to the status of the input and then report the closed-circuit time to the tenth of an hour. The input will accumulate and report in tenths of hours up to a total accumulated running time of 99,999.9 hours. The initial value of the Run Time Meter shall be programmable in order to agree with existing electromechanical Run Time Meters. Up to a total of eight Run Time Meters may be programmed.
 - c) Pulse Totalizer to count the accumulated number of pulses (momentary contact closures) occurring at the input so programmed. Any input channel may be programmed for a Totalizer Function, up to a maximum of eight. Maximum Input pulse rate is 100 Hz, with a 50% Duty Cycle. The spoken scaled value will not "rollover" to zero until a value of 4,294,967,294 has been exceeded.

- 4. Input/Output Expansion Capability: The standard unit shall be modular in design, permitting it, therefore, to accept "plug-in" expansion circuit boards to incorporate any of the following:
 - a) Contact Closure Expansion Capability to a total of 8, 16, 24, or 32 total dry contact inputs.
 - b) Analog Input Capability to a total of 1, 4, 8, or 16 total analog inputs.
 - c) Remote Supervisory Control Outputs to manipulate 4 or 8 output relays.
- 5. Modbus Communications: The unit shall accept an expansion card which enables it to communicate directly with devices utilizing Modbus RTU Protocol. A unit so configured shall be capable of "reading" and "writing" to 32, 64, or 96 data registers via Touch Tone Telephone. No modem or host computer shall be required. Interface shall consist of a single RS-232.
- 6. Alarm and Inquiry Messages: Upon initiating an alarm call, the system is to "speak" only those channels which are currently in "alarm status." Inquiry phone calls can be made directly to the unit at any time for a complete status report.
- 7. Acknowledgement: Alarms are acknowledged either by pressing a Touch Tone "9" as the call is being received, or by calling the unit back after having received an alarm call.
- 8. Nonvolatile Program Memory Retention: User-entered programming and voice messages shall be kept intact, even during power failures or when all power has been removed, for up to ten (10) years. This shall be accomplished through inclusion in the system of a lithium battery separate from the unit's backup rechargeable gel cell battery.
- 9. Local and Remote Programming Capabilities: The user may optionally elect to alter the following parameters from their standard normal default values via keyboard entry or remotely from any Touch Tone telephone.
 - a) Alarm Response Delay: 0.1 to 999.9 seconds, with different delays being assignable to different alarms.
 - b) Delay Between Alarm Call-outs: 0.1 to 99.9 minutes.
 - c) Alarm Reset Time: 0.1 to 99 hours, or "No Reset".
 - d) Incoming Ring Response (Answer) Delay: 1 to 20 Rings.
 - e) Number of Message Repetitions: 1 to 20 Repetitions.
 - f) Autocall Test: When enabled, the unit shall place a single round of test calls, both at the time this function is enabled, and also at regular subsequent intervals until this function is disabled.
 - g) Remote System Microphone Activation.
 - h) Remote Arming and Disarming of System.
- 10. Phone Line: The dialer is to use a standard "dial-up" telephone line (direct leased line is not required), and is to be F.C.C. approved. Connection to the telephone is through a 4- pin modular jack (RJ 11).
- 11. Speakerphone: The unit shall be capable of dialing any phone number on command and functioning as a speakerphone.
- 12. Real Time Clock: The unit shall be equipped with a real time clock thereby making the following possible:
 - a) Alarm Ready Schedule The dialer shall be user programmable to follow a specific schedule of operations. This shall include the flexibility to set a weekday, weekend, and

holiday schedule. With this feature the dialer shall arm and disarm itself according to the schedule programmed.

- b) In the event any of the printer configurations outlined in Section 6 are utilized, all alarm reports will be time and date stamped. Routine scheduled status reports can also be programmed.
- 13. Power/Battery Backup: Normal power shall be 105-135 VAC, 15 watts nominal. The product is to contain its own gel cell rechargeable battery which is automatically kept charged when AC power is present. The system shall operate on battery power for a minimum of 20 continuous hours in the event of AC power failure. A shorter backup time shall not be acceptable. The built-m charger shall be precision voltage controlled, not a "trickle charger", in order to minimize recharge time and to maximize battery life available.
- 14. Integral Surge Protection: All power, phone line. dry contact. and analog signal inputs shall be protected at the circuit board to IEEE Standard 587. category B (6,000 volts open circuit/3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each line.
- 15. Warranty: The dialer shall be covered by a five (5) year warranty covering parts and labor performed at the factory.
- 16. Additional Features: Sealed Switches. LED Indicators. Alarm Disable Warning. Talkthrough: All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED's shall indicate: Normal Operation, Program Mode, Call-in Progress, Status for each Channel, AC Power present, AC Power failure, and Low, Discharging, or Recharging Battery. On any inquiry telephone call, or On-Site status check, the voice shall provide specific warning if no dialout phone numbers are entered, or if the unit is in "alarm disabled" mode, or if AC power is off or has been off since last reset. A built-in microphone shall allow anyone at a remote site to listen to local sounds and to have a two-way conversation with personnel at the dialer.
- 17. Manufacturer: RACO Verbatim or Equal.
- d. Pump Control Panel: Provide space and mounting for the pump control panel as specified in Section 16290, Basic Control System Materials and Methods.
- e. Power panel: Provide power panel as specified in Section 16440, Panelboards.
- f. Flow Meter: Provide flow meter as specified in Section 16740, Process Instrumentation.
- g. Automatic/Manual Transfer Switch: Provide as specified in Section 16330, Transfer Switches.
- h. Generator Receptacle: Provide as specified in Section 16140, Wiring Devices.
- i. Provided 2' by 3' space and terminal strip for signal connections SCADA panel by Owner.
- j. Receptacles
 - 1. Interior enclosure receptacles shall be 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

- 2. Exterior receptacle shall be Straight blade, 125 V, 20 A, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped. Shall protected by an in-use weather proof cover.
- k. Wiring
 - 1. All wiring shall be in accordance with the applicable requirements of Section 16120, Low-Voltage Electrical Power Conductors and Cables.
- 1. Terminal Blocks
- m. Nameplates And Name Tags
 - 1. Panel mounted tags shall be plastic; field mounted tags shall be stamped stainless steel.
 - 2. Nameplate shall be engraved, rigid, laminated plastic type with adhesive back. Unless otherwise noted, color shall be black with white letters and letter height shall be 3/16 inch.

PART 3 - EXECUTION

3.01 <u>CONTROL PANELS</u>

- a. Control panels shall be completely fabricated, instruments installed and wired in the manufacturer's factory and tested prior to delivery to the site. The control panels shall be factory assembled with all input and output devices.
 - 1. All wiring and equipment shall be completed and tested prior to shipment.
 - 2. All external connections shall be by way of numbered terminal blocks.
 - 3. Install spare terminal blocks on backpanel.
- b. Panel instrumentation arrangement shall be as shown, with minor modifications as required by the particular equipment furnished. Modifications shall be subject to the approval of the Engineer.
- c. All back panels shall be secured with all the appropriate zinc plated mounting hardware.
- d. All devices and wiring shall be properly labeled.
 - 1. Front panel devices shall be identified by laminated nameplates
 - 2. Panel mounted devices and wiring shall be identified by a permanent marking system.
- e. All circuit breakers, terminal strips, and related devices required to provide a complete, safe, and neat installation shall be provided.
- f. Wiring
 - 1. Wires shall be 600-volt class, PVC insulated stranded copper and shall be of the sizes required for the current to be carried, but not below 14 AWG enclosed in either sheet metal raceway or plastic wiring duct.
 - 2. Wiring for signal circuits shall be twisted shielded pairs not smaller than No. 18 AWG, and be separated at least 6-inches from any power wiring.

- 3. All wires shall be identified as per the requirements of Section 16120, Low-Voltage Electrical Power Conductors and Cables.
- 4. Provide wiring channels as required.
- 5. All interconnecting wires between panel mounted equipment and external equipment shall be brought out to numbered external wiring terminals and terminated.
- 6. All wires shall be numbered and identified.
- g. Terminal Blocks
 - 1. Wires shall be terminated at the terminal blocks with crimp type, pre-insulated, ring-tongue lugs.
 - 2. Lugs shall be of the appropriate size for the terminal blocks screws and for the number and size of the wires terminated.
 - 3. Fused terminal Block shall be used for power distribution.
- h. Nameplates And Name Tags
 - 1. All components provided under this Section, both field and panel mounted, shall be provided with permanently mounted name tags bearing the entire tag number and description of the component.

3.02 <u>INSTALLATION</u>

- a. All items shall be installed in accordance with the manufacturer's recommendations.
- b. The Contractor shall furnish and install all material and hardware required to supply a complete and functional installation.
- c. All conduits shall stub up from the pad and into the panel on the concrete pedestals.
- d. Panel shall be installed on concrete pad.

3.03 <u>TESTING</u>

a. Test the complete installed system by demonstrating that all signals are properly received and sent and that the control system operates as intended.

3.04 <u>CLEANING AND TOUCH-UP PAINTING</u>

- a. The premises shall be kept free from accumulation of waste material and rubbish. Upon completion of work, the Contractor shall remove materials, scraps, and debris from the site. Scratches, scrapes, or ships in interior or exterior surfaces of devices shall be touched up with finishes matching as nearly as possible the type and color of the original finish.
- b. All material, equipment, and workmanship shall be subject to inspection by the Engineer or his representatives. In the event the Engineer finds the materials or workmanship not in accordance with these Contract Documents, the work or materials shall be removed and replaced, or corrected, by and at the expense of the Contractor.

END OF SECTION

SECTION 16140 WIRING DEVICES

PART 1 - GENERAL

1.01 <u>SUMMARY</u>

- a. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Generator receptacles.
 - 3. Snap switches.

1.02 **DEFINITIONS**

- a. EMI: Electromagnetic interference.
- b. GFCI: Ground-fault circuit interrupter.
- c. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- d. RFI: Radio-frequency interference.
- e. UTP: Unshielded twisted pair.

1.03 <u>SUBMITTALS</u>

- a. Product Data: For each type of product indicated.
- b. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- c. Field quality-control test reports.
- d. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.04 **QUALITY ASSURANCE**

- a. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

c. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- a. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Or equal.

2.02 STRAIGHT BLADE RECEPTACLES

- a. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Or equal.
- b. Explosion Proof Receptacle 125V, 20A NENA6 enclosure a/ cooper

2.03 <u>GFCI RECEPTACLES</u>

- a. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- b. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.
 - c. Or equal.

2.04 <u>GENERATOR RECEPTACLES</u>

a. Single Receptacle, Voltage, Phase, and AMPS as indicated on drawings.

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Meltric
 - b. Cooper; L520R.
 - c. Hubbell; HBL2310.
 - d. Or equal.
- 2. NEMA 4X enclosure with metal angle adaptor.
- 3. UL and CSA switch rated.
- 4. Spring loaded butt style contacts.
- 5. Lock out tag out capable.

2.05 <u>SNAP SWITCHES</u>

- a. Comply with NEMA WD 1 and UL 20.
- b. Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Or equal.

2.06 WALL PLATES

- a. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- b. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weatherresistant, die-cast aluminum with lockable cover.

2.07 <u>FINISHES</u>

a. Color: Wiring device catalog numbers in Section Text do not designate device color and shall be stainless steel unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- a. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- c. Coordination with Other Trades:
 - 1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 3. Install wiring devices after all wall preparation, including painting, is complete.
- d. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- e. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- f. Receptacle Orientation:

- 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
- 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- g. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

3.02 **IDENTIFICATION**

a. Comply with Section 16075, Identification for Electrical Systems.

3.03 FIELD QUALITY CONTROL

- a. Perform tests and inspections and prepare test reports.
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- b. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- c. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- d. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- e. Prepare test and inspection reports.

END OF SECTION

SECTION 16200 ELECTRIC MOTORS

PART 1 - GENERAL

1.01 <u>SUMMARY</u>

a. This Section includes general requirements for polyphase electric motors for use in the water environment.

1.02 COORDINATION

- a. Coordinate features of motors, installed units, and accessory devices and features to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

1.03 <u>REFERENCES</u>

- a. ANSI/AFBMA 9-2-2015, Load Ratings and Fatigue Life for Ball Bearings
- b. ASTM B117-90, Test Method of Salt Spray (Fog) Testing
- c. IEEE Standard 112-2004, IEEE Standard Test Procedure for Polyphase Induction Motor and Generators
- d. IEEE Standard 841-2009, IEEE Standard for Petroleum and Chemical Industry Severe Duty
- e. NEMA MG 13 1984(R1990), Frame Assignments for Alternating Current Integral Horsepower Induction Motors
- f. NEMA MG 1-2016, Motors and Generators

1.04 <u>SUBMITTALS</u>

- a. The following information shall be provided:
 - 1. Horsepower, Speed, Frame
 - 2. Motor outline drawing with weight
 - 3. Current, efficiency, and power factor @ at 100%, 75%, 50%, 25%, and no load
 - 4. Locked rotor current at rated voltage
 - 5. Efficiency at full load
 - 6. Speed / Torque curve
 - 7. Maximum KVAR allowed for Power Factor correction
 - 8. Connection diagram
 - 9. Connection diagram for auxiliary equipment
 - 10. Bearing size and type

PART 2 - PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

- a. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
- b. Comply with NEMA MG 1 unless otherwise indicated.
- c. Comply with IEEE 841 for severe-duty motors.

2.02 <u>DESIGN STANDARDS</u>

- a. Motors shall be 3 phase induction machines rated continuous duty at 60 HZ, single voltage with across-the-line full voltage start, unless otherwise noted.
- b. Production AC motors are available in 56 through 5811 frames at speeds of 3600, 1800, 1200, and 900RPM.
- c. Stock AC motors are available in 56T through 447T frames 1-200HP at speeds of 3600, 1800 and 1200RPM, 480 Volt designs.
- d. Motors comply with the frame size assignments of NEMA MG 13.
 - 1. Any motors that require special modifications, such as "TZ" shafts or special "D" flanges shall be noted clearly in the submittals with spare recommendations from the manufacturer.
 - 2. All motors that are not standard NEMA 1964 re-rate "T" frame motors shall be factory painted blue with pink conduit boxes attached to be clearly identified to the owner. At installation, the Contractor shall paint the motors to the owners choice of color.
- e. NO IEC MOTORS WILL BE ALLOWED.
- f. Motor manufacturer shall be an active member of NEMA.
- g. Motor manufacturer shall have experience in the design and manufacture of similar products for a minimum of 10 years. Buy-out or private labeled motors are not acceptable.
- h. All fractional to 2 HP direct current (DC) motors shall be either permanent magnet or shunt wound design with a constant torque speed range or 20:1
- i. Acceptable motor manufacturers will be US Motors, General Electric, Reliance or equal.

2.03 <u>ENCLOSURES</u>

- a. All vertical motors shall be NEMA Weather Protected type 1 unless located with 10 feet of a process treatment unit. Vertical motors located within 10 feet of a process treatment unit shall be Open Drip Proof (ODP) Corro-duty rated.
- b. All general purpose horizontal motors for outdoor operation or location in hostile environments shall be TEFC and meet specification IEEE 841.
- c. All motors in hazardous locations shall be Division One explosion proof, as defined by UL, meeting the Class and Group as required by the hazard.
 - 1. Motors shall meet their nameplate ratings at or below B rise. As standard, motors shall be capable of operating continuously at 15% overload at or below F rise.
 - 2. Motors shall be NEMA design B as standard.
 - 3. Inverter duty motors shall meet their nameplate ratings at or below F rise, during inverter variable torque operation.

- 4. All motors shall be premium efficient design.
- 5. All motor frame parts, including frame, brackets, and fan covers shall be Class 30, cast iron or fabricated steel dependent on application.
- 6. Brackets shall have jack screws as standard to facilitate easy removal with standard tools.
- 7. Oversize main conduit box will be Class 30 cast iron. Conduit box shall be capable of rotation in 90-degree increments, diagonally split, with tapped NPT threaded conduit entry hole. Motor leads will be potted to the frame to prevent ingress of dirt and moisture. Connection diagrams shall be affixed to the inside of the conduit box. There shall be a gasket between the conduit box and the frame.
- 8. Auxiliary conduit boxes will be cast iron Class 30. Conduit box shall be capable of rotation in 90-degree increments, diagonally split, with tapped NPT threaded conduit entry hole. Oversized auxiliary conduit boxes for mounting of electronics may be fabricated steel construction with a NEMA 4 rating. There shall be a gasket between the conduit box and the frame.
- 9. The entire frame assembly shall be varnished and baked to prevent corrosion and to provide a clean internal and external surface for easier maintenance.
- 10. All parts shall be thoroughly cleaned to remove rust, scale, oxidation products, and the oil and grease associated with the manufacturing process. The motor is shall then be coated with a water reducible metal primer @ 1-1.3 mils dft. (Primer to be performance tested for 240 hours salt spray test). Motor shall be finished coated with a Quick Dry Water Reducible Enamel resulting in a total finished coat of 4-5mils dft.
- 11. Motors shall have a lifting means as part of the construction as standard.
- 12. Motor nameplate shall be made of Stainless Steel and have all information per NEMA MG1-20.60 as standard.
- 13. 4 pole and slower motors shall have shafts manufactured from C1045 and have stiffening ribs to insure critical speeds above rated speed.
- 14. All motors shall be of stiff shaft design.
- 15. Antifriction grease lube bearings shall be single shielded.
- 16. Antifriction oil lube bearings shall be open design for cooler running.
- 17. Oil or grease bearings shall be sized appropriately for motor size, speed, overhung load, and thrust requirements.
- 18. High thrust motors shall be supplied with conservatively rated angular contact bearings. Motor design shall allow thrust bearings replacement on site without the use of special tools.
- 19. If sleeve bearings are required, the magnetic center shall be indicated by a permanent mark.
- 20. The stator shall be manufactured of electrical grade, C5 silicon steel. Laminations shall be secured with steel locking rings and full-length keys.
- 21. Stator shall be manufactured utilizing Heavy Armored Poly Thermaleze wire with corona resistant coating.

- 22. The coils shall be housed in semi-enclosed slots insulated with high dielectric, high temperature class 155-degrees C slot liner, then secured with high temperature rated melamine top sticks. After the stator is assembled it shall be insulated with a 100% solids resilient polyester resin, class H rated, applied by a Vacuum Pressure Impregnation process.
- 23. A full class H insulation system shall be provided
- 24. Motor leads to be non-wicking type, Class F. Leads are to be numbered for identification.
- 25. Rotors shall be of a fabricated copper bar design to facilitate appropriate electrical design for the application, cooler running operation, high strength for starting current requirements and thermal cycling, and ease of repair.
- 26. The rotor shall be manufactured of electrical grade, C5 silicon steel.

2.04 <u>SERVICE CONDITIONS</u>

- a. Motor are suitable for continuous duty operation without derating under the following service conditions:
 - 1. Exposure to ambient temperatures from -25C to 40C
 - 2. Exposure to altitudes up to 1000meters (3300feet)
- b. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor. Motors may be constant or variable torque as required to meet the conditions of the load being serviced.
- c. Suitable for use in indoor or outdoor applications involving severe duty conditions such as high humidity or chemical laden, corrosive or salty atmospheres.
- d. Motors are capable of successfully accelerating inertia loads equal to what is specified in section 12.54 of NEMA MG 1 4.4 Variable Frequency Drive (VFD) or Full voltage, across-the-line starting.

2.05 <u>ELECTRICAL DESIGNS</u>

- a. Motors shall be NEMA Design B as defined in section 1.17.1.2 of NEMA MG 1, unless specifically noted requiring different motor curves.
- b. Motors shall operate successfully at rated load under the combinations of voltage and frequency variations specified in section 12.44 of NEMA MG 1
- c. Motors shall operate successfully under running conditions at rated load and frequency when voltage unbalance at the motor terminals does not exceed 1%.
- d. Motors shall be premium efficient designs that exceed the efficiency values in Table 1 of IEEE Standard 841. Efficiency testing is done in accordance with IEEE standard 112, subclause 6.4 Method B. The nominal efficiency, ³/₄ load efficiency and guaranteed minimum efficiency, are stamped on the motor's nameplate.
- e. Motors shall utilize a non-hygroscopic, chemical and humidity resistant insulation system. The thermal rating of the system is Class F as defined in section 1.66 on NEMA MG1.

- f. The stator windings for 1-200HP and under 600 volts are random or form wound with copper wire utilizing inverter grade insulation system that meets and exceeds NEMA MG1 Part 31.
- g. Stator is double dipped and baked in varnish to form a heavy build that exceeds the test criteria of moisture resistance per NEMA MG-1.
- h. When operated at rated horsepower, voltage and frequency, the temperature rise of the stator winding does not exceed 80C when measured by winding resistance.
- i. Motors shall utilize the inverter grade insulation system which consists of at a minimum Class F or better insulation materials with additional phase insulating material, extra end-turn bracing and Class H spike resistant wire. The resultant system shall withstand 2000 volt transients without premature motor failure and have no cable limitations in motor application.
- j. Motors shall operate successfully under inverter running conditions at rated load with variation in the voltage or the frequency not exceeding the following conditions:
 - 1. +/-10% rated voltage at rated constant volts/hertz ratio except for specific torque boost situations.
 - 2. Motors shall operate successfully under running conditions at rated load and volts/hertz ratio when the voltage unbalance at the motor terminals does not exceed one percent.
- k. Inverter Operating Characteristics With rated volts/hertz ratio applied, motor performance shall be as follows for critical operating characteristics:
 - 1. Torque Motors shall meet or exceed the minimum locked rotor (starting) and breakdown torque specified in NEMA Standard MG1 Part 12 for Design B for the rating specified when on sine wave power.
 - 2. Currents –Maximum overload current shall be 150% of nameplate for 60 seconds or 175% for 3 seconds.
- 1. Motors shall be rated for a 1.15 service factor on sine wave power and 1.0 service factor on VFD power in a 40C ambient.

2.06 MECHANICAL DESIGN

- a. Motors are equipped with ball bearings have AFBMA C/3 clearances and shall be the same size on both ends (with exception of 440T frame minimum 6318 on Drive end bearing).
- b. Bearings are regreasable without disassembling the fan or fan cover and provide for the elimination of purged grease through fittings extending beyond the fan cover. Polyurea thickened grease shall be supplied.
- c. Inner bearing caps are provided for bearing retention and to prevent harmful amounts of lubricant from entering the motor interior.
- d. For direct coupled motors, stabilized bearing temperature shall not exceed a temperature rise of 45C for 4 and 6 pole motors and a maximum temperature rise of 50C for 2 pole motors as measured by a thermocouple on the surface of the bearing house.
- e. Bearings provide for an L-10 life of 200,000 hours per ANSI/AFBMA 9-1990 based on NEMA belting application limits per NEMA MG1, section 14.41.

- f. Enclosures have a degree of protection IP55 (per NEMA MG1 part 5). Bearing isolators are provided on all 143 to 5811 'T' frame motors to minimize entrance of moisture and contaminants into the bearing chamber. Motors shall be capable of field retrofit of an opposite drive end endshield bearing isolator.
- g. Condensation drain holes are provided at the low points in the end brackets and are supplied with corrosion resistant, breather drain plugs.
- h. Frame, brackets, fan cover and conduit box are a minimum of grade 25 cast iron.
- i. The maximum permissible shaft runout at the end of the shaft extension of the assembled motor shall be:
 - 1. 0.875" to 1.625" diameter inclusive TIR < 0.001 6.10.2 Over 1.626" to 6.50" diameter, TIR,0.0015 (ball bearing) and , 0.002 (roller bearing)
- j. Motor mounting feet, when placed on a flat granite surface, shall not exceed 0.005" between the granite surface and the motor feet at each mounting bolt hole.
- k. A drilled and tapped hole is provided in the motor frame on the same side as the conduit box for grounding purposes. Motor frame feet are flat within 0.005 inch as an assembled unit.
- 1. Ventilating fans are of non-sparking conductive plastic material. Most ratings use bidirectional fans. On ratings where uni-directional fans are used, the rotation of the fan is indicated by a permanent label on the outside of the motor.
- m. Conduit box is diagonally split, rotatable in 90 degree increments, and twice the volume as specified in Section 11.06.2 of NEMA MG1. A ground lug is provided in the box. Gaskets are provided between the conduit box and frame and between conduit box base and cover providing a moisture resistant barrier.
- n. Shouldered eyebolts with a minimum safety factor of 10 are provided for motor lifting.
- o. All fastening hardware is hex-head bolts or socket head cap screws with a grade 5, zinc/cadmium plating.
- p. Motor cast iron components are oxide primed and painted with vinyl phenolic paint to surpass 250-hour salt spray test per ASTM B117-90.
- q. Motor nameplate is stainless steel and secured with 4 stainless steel drive pins. Nameplates are capable of meeting 720-hour salt spray test per ASTM B117-90. Each nameplate contains the following information in addition to that noted in section 10.40 of NEMA MG1.
 - 1. AFBMA bearing ID
 - 2. Manufacture date code
 - 3. Compliance with IEEE Standard 841
 - 4. Motor weight
 - 5. Guaranteed minimum efficiency
 - 6. Maximum space heater surface C temperature, if provided, when operating at rated voltage in a 40C ambient
 - 7. Balance
 - 8. NEMA MG1 Part 31

r. Machined frame to endshield joints are protected by an application of 2 part epoxy before assembly.

2.07 <u>AIRBORNE SOUND</u>

a. Motor sound power level when measured at a no load condition shall not exceed 90 dBA when determined in accordance with IEEE Standard 85

2.08 <u>VIBRATION</u>

- a. Motor vibration measured in any direction on the bearing housing meets the levels listed below when tested per section 12.08 of NEMA MG1:
 - 1. Unfiltered vibration at rated voltage and frequency does not exceed 0.08 in/s peak velocity for 2, 4 and 6 pole motors and .06 in/s peak velocity for 8 pole motors.
 - 2. Filtered vibration does not exceed 0.05 in/s peak velocity at a frequency of 2f (twice line frequency)
 - 3. Unfiltered axial vibration does not exceed 0.06 in/s peak velocity on bearing housing (does not apply to roller bearings)

2.09 <u>ACCESSORIES</u>

- a. Winding thermostats shall be in each phase of the motor. There shall be one per phase, NO or NC as indicated on the control wiring diagrams, connected to terminal strip in the auxiliary outlet box.
- b. Grounding provisions shall be in the main terminal box.
- c. For vertical hollow shaft motors, a ball-type non-reversing ratchet shall be provided to prevent back-spin of the pump and motor. Maximum reverse rotation shall be limited to 5 degrees or arc.
- d. Stabilizing bushings shall be provided on all vertical hollow shaft motors applied to pumps with mechanical seals. All 3600RPM hollow shaft motors shall be provided with stabilizing bushings.
- e. Motors 20HP and above shall be started on soft starts or variable frequency drives. Full voltage bypass starting shall be permitted.
- f. All motors shall be provided with suitable coupling for connection to mechanical loads.
- g. All inverter duty motors shall be equipped with shaft grounding device.

PART 3 - EXECUTION

3.01 **PRODUCTION TESTS**

- a. The following tests are to be performed on all motors:
 - 1. Measurement of winding resistance (with feeder conductors disconnected.)
 - 2. No load readings of current, power, and speed at rated voltage and frequency
 - 3. Mechanical vibration check as described in 8.1, using either elastic or rigid mount
 - 4. High potential test in accordance with section 12.03 of NEMA MG1
- b. The following test information is recorded and inserted in the motors' conduit box and provided to the owner in a binder. (Binder to include 1 page per each motor showing actual field test and nameplate data.).

- 1. Winding Resistance
- 2. No load current, voltage and speed
- 3. The following five unfiltered vibration readings, measured as described in 8.1: drive end (horizontal, vertical, and axial) and opposite drive end (horizontal and vertical)

3.02 WARRANTY

- a. Motor components shall have a full five year performance warranty on sine wave power and three year warranty on inverter power.
- b. The contractor shall be fully responsible for proper storage of motors prior to placing in service in accordance with the manufacturers' recommendations and instructions. Any problem with motors at start up due to mishandling or by not adhering to the manufacturers' recommendations for storage will be the sole responsibility of the contractor. All costs to repair the motors due to any mishandling or improper storage will be at no cost to the owner, the supplier, or the manufacturer of the motor, but shall be entirely the responsibility of the contractor.

END OF SECTION

SECTION 16210 ELECTRICAL UTILITY SERVICES

PART 1 - GENERAL

1.01 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Arrangements with Utility Company for permanent electric service.
 - 2. Payment of Utility Company for service charges.

1.02 <u>DEFINITIONS</u>

a. Utility Company: Eversource Energy

1.03 <u>COORDINATION</u>

- a. Coordinate Work of this Section with Utility Company (Eversource), including relocation of overhead or underground lines interfering with construction.
- b. Service Installation:
 - 1. Contact Utility Company regarding charges related to service installation and include charges in Contract.

1.04 <u>SUBMITTALS</u>

- a. Submit drawings prepared by Utility Company.
- b. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- c. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

1.05 **QUALITY ASSURANCE**

a. Perform Work according to Utility Company written requirements and maintain one copy at Site.

1.06 FIELD MEASUREMENTS

a. Verify that field measurements are as indicated on Drawings.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- a. System Characteristics: 120/240 V, single phase, three wire, 60 Hz.
- b. Service Entrance: Underground.
- c. Underground Service Provisions:
 - 1. Underground service entrance to pump station control panel.
 - 2. Utility Service-Entrance Conductor Connection: At utility company handhole at Valley View Circle, and at utility pole at Piper Road.

2.02 <u>UTILITY METERS</u>

a. Furnished by Utility Company.

2.03 <u>UTILITY METER BASE</u>

a. Meter base shall be in conformance with Eversource standards.

PART 3 - EXECUTION

3.01 EXAMINATION

a. Verify that service equipment is ready to be connected and energized.

3.02 PREPARATION

- a. Maintain access to existing service equipment, boxes, metering equipment, and other installations remaining active and requiring access, by modifying installation or by providing access panel.
- b. Coordinate installation of service entrance conduit with utility company.

3.03 INSTALLATION

- a. Service Entrance Conduit at Utility Pole:
 - 1. Install conduits ten feet up the utility pole with pull wire.
 - 2. Install drip loop in service conductors.
- b. Service entrance at handhole:
 - 1. Install conduits into handhole with pull wire.
 - 2. Install drip loop in service conductors.

- c. Service Entrance Conduits at Pump Stations:
 - 1. Install service entrance conduits to pump station meter socket.

END OF SECTION

SECTION 16215 TELEPHONE UTILITY SERVICES

PART 1 - GENERAL

1.01 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Arrangements with Utility Company for permanent electric service.
 - 2. Payment of Utility Company for service charges.

1.02 <u>DEFINITIONS</u>

a. Utility Company: Verizon

1.03 <u>COORDINATION</u>

- a. Coordinate Work of this Section with Utility Company (Verizon), including relocation of overhead or underground lines interfering with construction.
- b. Service Installation:
 - 1. Contact Utility Company regarding charges related to service installation and include charges in Contract.

1.04 <u>SUBMITTALS</u>

- a. Submit drawings prepared by Utility Company.
- b. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- c. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

1.05 **QUALITY ASSURANCE**

a. Perform Work according to Utility Company written requirements and maintain one copy at Site.

1.06 FIELD MEASUREMENTS

a. Verify that field measurements are as indicated on Drawings.

PART 2 - PRODUCTS

2.01 <u>SYSTEM DESCRIPTION</u>

- a. Service Entrance: Underground.
- b. Underground Service Provisions:
 - 1. Underground service entrance to pump station control panel.
 - 2. Utility Raceway Connection at Valley View Circle Pump Station: At utility company handhole.
 - 3. Utility Raceway Connection at Piper Road Pump Station: At utility pole.

PART 3 - EXECUTION

3.01 <u>EXAMINATION</u>

a. Verify that service equipment is ready to be connected and energized.

3.02 INSTALLATION

- a. Service Entrance Conduit for Piper Road Pump Station:
 - 1. Install conduit ten feet up the utility pole.
 - 2. Install drip loop in service conductors.
- b. Service Entrance Conduit at Valley View Circle Pump Stations:
 - 1. Install service entrance conduit to utility company hand hole.

END OF SECTION

<u>SECTION 16230</u> GAS-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 <u>RELATED DOCUMENTS</u>

a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Engine.
 - 2. Gas fuel system.
 - 3. Control and monitoring.
 - 4. Generator overcurrent and fault protection.
 - 5. Generator, exciter, and voltage regulator.
 - 6. Load bank.
 - 7. Outdoor generator-set enclosure.
 - 8. Vibration isolation devices.
- b. Related Requirements:
 - 1. Section 16330 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generators.

1.3 <u>DEFINITIONS</u>

- a. EPS: Emergency power supply.
- b. EPSS: Emergency power supply system.
- c. LP: Liquefied petroleum.
- d. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- 2. Include thermal damage curve for generator.
- 3. Include time-current characteristic curves for generator protective device.
- 4. Include fuel consumption in cubic feet per hour (cubic meters per hour) at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
- 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
- 6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95 deg F (35 deg C), 80 deg F (27 deg C), 70 deg F (21 deg C), and 50 deg F (10 deg C). Provide drawings showing requirements and limitations for location of air intake and exhausts.
- 7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
- a. Shop Drawings:
 - 1. Include plans and elevations for engine generator and other components specified.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Identify fluid drain ports and clearance requirements for proper fluid drain.
 - 4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
 - 6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.
 - 7. Generator Supplier shall submit a motor starting analysis based on the one line diagram shown in the drawings.

1.5 INFORMATIONAL SUBMITTALS

- a. Qualification Data: For Installer, manufacturer, and testing agency.
- b. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, supplied enclosure, external silencer, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- c. Source Quality-Control Reports: Including, but not limited to, the following:
 - 4. Certified summary of prototype-unit test report.

- 5. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
- 6. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
- 7. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
- 8. Report of sound generation.
- 9. Report of exhaust emissions showing compliance with applicable regulations.
- 10. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- d. Field quality-control reports.
- e. Warranty: For special warranty.

1.6 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01770 "Project Closeouts" include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- a. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
 - 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
 - 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
 - 4. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 QUALITY ASSURANCE

- a. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
- b. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

- c. Source Limitations: Obtain packaged generator set and auxiliary components through one source from a single manufacturer.
- d. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- e. Comply with NFPA 37.
- f. Comply with NFPA 70.
- g. Comply with UL 2200.
- h. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- i. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- j. Testing Agency Qualifications: Accredited by NETA
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 **PROJECT CONDITIONS**

- a. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner and Engineer no fewer than ten working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's or Engineer's written permission.
- b. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature Minus 15 to plus 40 deg C.
 - 2. Relative Humidity: 0 to 95 percent.
 - 3. Altitude: Sea level to 1000 feet (300 m)

1.10 <u>COORDINATION</u>

a. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

- a. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

1.12 MAINTENANCE SERVICE

a. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 <u>MANUFACTURERS</u>

- a. Subject to compliance with requirements, provide products by one of the following:
 - 1. Kohler Co.; Generator Division.
 - 2. Onan/Cummins Power Generation; Industrial Business Group
 - 3. Caterpillar; Engine Div.
 - 4. Or equal
- b. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

2.2 <u>PERFORMANCE REQUIREMENTS</u>

- a. Seismic Performance: Engine generator housing, engine generator, batteries, battery racks, silencers, and sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.0.
- b. B11 Compliance: Comply with B11.19.
- c. NFPA Compliance:
 - 1. Comply with NFPA 37.

- 2. Comply with NFPA 70.
- 3. Comply with NFPA 99.
- 4. Comply with NFPA 110 requirements for Level 1 EPSS.
- d. UL Compliance: Comply with UL 2200.
- e. Engine Exhaust Emissions: Comply with EPA Tier 4 requirements and applicable state and local government requirements.
- g. Noise Emission: Comply with 78 dba @ 8 meters for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- h. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).
 - 2. Relative Humidity: Zero to 95 percent.
 - 3. Altitude: Sea level to 1000 feet (300 m).

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- a. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.
- c. Power Rating: Standby.
- d. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.
- e. EPSS Class: Engine generator shall be classified as Class 48 according to NFPA 110.
- f. Service Load: 30 kW.
- g. Power Factor: 1.0, lagging.
- h. Frequency: 60 Hz.
- i. Voltage: 240 V ac.
- j. Phase: Single-phase, three wire.
- k. Induction Method: Turbocharged.
- 1. Governor: Adjustable isochronous, with speed sensing.
- m. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

- 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- n. Capacities and Characteristics:
 - 2. Power Output Ratings: Nominal ratings as indicated at 1.0 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.
 - 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- o. Engine Generator Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent stepload increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
 - 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 - 7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
 - 8. Start Time:
 - a. Comply with NFPA 110, Type 10 system requirements.
 - b. 10 seconds.
- p. Engine Generator Performance for Sensitive Loads:
 - 1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
 - a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
 - 2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.

- 3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent stepload increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
- 4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
- 5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
- 6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
- 7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
- 8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
- 9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
 - a. Provide permanent magnet excitation for power source to voltage regulator.
- 10. Start Time:
 - a. Comply with NFPA 110, Type 10 system requirements.
 - b. 10 seconds.
- q. Parallel Engine Generators:
 - 1. Automatic reactive output power control and load sharing between engine generators operated in parallel.
 - 2. Automatic regulation, automatic connection to a common bus, and automatic synchronization, with manual controls and instruments to monitor and control paralleling functions.
 - 3. Protective relays required for equipment and personnel safety.
 - 4. Paralleling suppressors to protect excitation systems.
 - 5. Reverse power protection.
 - 6. Loss of field protection.

2.4 <u>GAS ENGINE</u>

- a. Fuel: Natural gas.
- b. Rated Engine Speed: 1800 rpm.
- c. Lubrication System: Engine or skid-mounted.
 - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.

- 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
- 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- d. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.
- e. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.
 - 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition
 - 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 - 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 - 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and non collapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- f. Muffler/Silencer:
 - 1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of 25 dB at 500 Hz.
 - b. Sound level measured at a distance of 25 feet (8 m) from exhaust discharge after installation is complete shall be 78 dBA or less.
- g. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- h. Starting System: 12-V electric, with negative ground.
 - 1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
 - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 - 3. Cranking Cycle: 30 seconds.

- 4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
- 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
- 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F (10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
- 7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
- 8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
- 9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F (minus 40 deg C) to 140 deg F (plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 <u>GAS FUEL SYSTEM</u>

- a. Natural Gas Piping: Coordinate with Columbia Gas.
- b. Gas Train: Comply with NFPA 37.
- c. Natural Gas, Vapor-Withdrawal System:
 - 1. Carburetor.
 - 2. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.

- 3. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.
- 4. Fuel Filters: One for each fuel type.
- 5. Manual Fuel Shutoff Valves: One for each fuel type.
- 6. Flexible Fuel Connectors: Minimum one for each fuel connection.
- 7. Fuel change gas pressure switch.

2.6 <u>CONTROL AND MONITORING</u>

- a. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- b. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- c. Provide minimum run time control set for 30 minutes with override only by operation of a remote emergency-stop switch.
- d. Comply with UL 508A.
- e. Configuration:
 - 1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.
 - 2. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common wall-mounted control and monitoring panel. Panel shall be powered from the engine generator battery.
 - 3. Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel shall be powered from the engine generator battery. Panel features shall include the following:
 - a. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6.
 - b. Switchboard Construction: Freestanding unit complying with Section 16410, Enclosed Switches and Circuit Breakers. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.
- f. Control and Monitoring Panel:

- 4. Digital controller with integrated LCD, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
- 5. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
- 6. Instruments: Located on the control and monitoring panel and viewable during operation.
 - a. Engine lubricating-oil pressure gage.
 - b. Engine-coolant temperature gage.
 - c. DC voltmeter (alternator battery charging).
 - d. Running-time meter.
 - e. AC voltmeter.
 - f. AC ammeter.
 - g. AC frequency meter.
 - h. Generator-voltage adjusting rheostat.
- 7. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:
 - a. Cranking control equipment.
 - b. Run-Off-Auto switch.
 - c. Control switch not in automatic position alarm.
 - d. Overcrank alarm.
 - e. Overcrank shutdown device.
 - f. Low water temperature alarm.
 - g. High engine temperature prealarm.
 - h. High engine temperature.
 - i. High engine temperature shutdown device.
 - j. Overspeed alarm.
 - k. Overspeed shutdown device.
 - 1. Low fuel main tank.
 - 1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required for the indicated EPSS class.
 - m. Coolant low-level alarm.
 - n. Coolant low-level shutdown device.
 - o. Coolant high-temperature prealarm.
 - p. Coolant high-temperature alarm.
 - q. Coolant low-temperature alarm.
 - r. Coolant high-temperature shutdown device.
 - s. EPS supplying load indicator.
 - t. Battery high-voltage alarm.
 - u. Low cranking voltage alarm.
 - v. Battery-charger malfunction alarm.
 - w. Battery low-voltage alarm.
 - x. Lamp test.
 - y. Contacts for local and remote common alarm.
 - z. Low-starting air pressure alarm.
 - aa. Low-starting hydraulic pressure alarm.
 - bb. Remote manual stop shutdown device.
 - cc. Air shutdown damper alarm when used.
- dd. Air shutdown damper shutdown device when used.
- ee. Hours of operation.
- ff. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.
- gg. Generator overcurrent protective device not closed alarm.
- g. Connection to Datalink:
 - 1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
 - 2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet.
- h. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.
- i. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
 - 3. Overcrank alarm.
 - 4. Coolant low-temperature alarm.
 - 5. High engine temperature prealarm.
 - 6. High engine temperature alarm.
 - 7. Low lube oil pressure alarm.
 - 8. Overspeed alarm.
 - 9. Low fuel main tank alarm.
 - 10. Low coolant level alarm.
 - 11. Low cranking voltage alarm.
 - 12. Contacts for local and remote common alarm.
 - 13. Audible-alarm silencing switch.
 - 14. Air shutdown damper when used.
 - 15. Run-Off-Auto switch.
 - 16. Control switch not in automatic position alarm.
 - 17. Fuel tank derangement alarm.
 - 18. Fuel tank high-level shutdown of fuel supply alarm.
 - 19. Lamp test.
 - 20. Low cranking voltage alarm.
 - 21. Generator overcurrent protective device not closed.
- j. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

k. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.7 <u>GENERATOR OVERCURRENT AND FAULT PROTECTION</u>

- a. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
 - 1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
 - 2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.
- b. Generator Overcurrent Protective Device:
 - 1. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:
 - a. Tripping Characteristic: Designed specifically for generator protection.
 - b. Trip Rating: Matched to generator output rating.
 - c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
 - d. Mounting: Adjacent to or integrated with control and monitoring panel.
- c. Generator Protector: Microprocessor-based unit shall continuously monitor current level of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
 - 1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
 - 2. Under single phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 - 3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
 - 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.8 <u>GENERATOR, EXCITER, AND VOLTAGE REGULATOR</u>

- a. Comply with NEMA MG 1.
- b. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

- c. Electrical Insulation: Class H.
- d. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six 12 lead alternator.
- e. Range: Provide broad range of output voltage by adjusting the excitation level.
- f. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- g. Enclosure: Dripproof.
- h. Instrument Transformers: Mounted within generator enclosure.
- i. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
 - 1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
 - 2. Maintain voltage within 20 percent on one step, full load.
 - 3. Provide anti-hunt provision to stabilize voltage.
 - 4. Maintain frequency within 5 percent and stabilize at rated frequency within 2 seconds.
- j. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- k. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- 1. Subtransient Reactance: 12 percent, maximum.

2.9 <u>OUTDOOR GENERATOR-SET ENCLOSURE</u>

- a. Description:
 - 1. Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
 - a. Sound Attenuation Level: 78 DBA @ 8 m (25-feet).
 - 2. Prefabricated or pre-engineered galvanized-steel-clad, integral structural-steel-framed, walk-in enclosure, erected on concrete foundation.
- b. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 100 mph (160 km/h).
- c. Hinged Doors: With padlocking provisions.
- d. Muffler Location: Within enclosure.

- e. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
 - 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
 - 2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
 - 3. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.
- f. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

- a. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
 - 1. Material: Standard neoprene separated by steel shims.
 - 2. Shore "A" Scale Durometer Rating: 50.
 - 3. Number of Layers: Two.
 - 4. Minimum Deflection: 1 inch (25 mm).
- b. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
 - 5. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 - 6. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
 - 7. Minimum Additional Travel: 50 percent of required deflection at rated load.
 - 8. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 9. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 10. Minimum Deflection: 1 inch (25 mm).
- c. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 <u>FINISHES</u>

a. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

- a. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.
- b. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 - 2. Test generator, exciter, and voltage regulator as a unit.
 - 3. Full load run.
 - 4. Maximum power.
 - 5. Voltage regulation.
 - 6. Transient and steady-state governing.
 - 7. Single-step load pickup.
 - 8. Safety shutdown.
 - 9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
 - 10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 <u>EXAMINATION</u>

- a. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- b. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- c. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 <u>PREPARATION</u>

- a. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Engineer no fewer than two working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Engineer's written permission.

3.3 <u>INSTALLATION</u>

- a. Comply with NECA 1 and NECA 404.
- b. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- c. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 03005, Structural Concrete.
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
 - 3. Install packaged engine generator with elastomeric isolator pads having a minimum deflection of 1 inch (25 mm) on 4-inch- (100-mm-) high concrete base. Secure engine generator enclosure to anchor bolts installed in concrete bases.
- d. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- e. Cooling System: Install Schedule 40, black steel piping with welded joints for cooling water piping between engine generator and heat exchanger.
 - 1. Install isolating thimbles where exhaust piping penetrates combustible surfaces. Provide a minimum of 9 inches (225 mm) clearance from combustibles.
 - 2. Insulate cooling system piping and components.
- f. Exhaust System: Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
 - 1. Install isolating thimbles where exhaust piping penetrates combustible surfaces with a minimum of 9-inch (225-mm) clearance from combustibles.
- g. Drain Piping: Install condensate drain piping to muffler drain outlet with a shutoff valve, stainlesssteel flexible connector, and Schedule 40, black steel pipe, the full size of the drain connection, with welded joints.
- h. Gaseous Fuel Piping: Coordinate with Columbia Gas.
- i. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 <u>CONNECTIONS</u>

a. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

- b. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- c. Connect cooling-system water piping to engine generator with flexible connectors.
- d. Connect engine exhaust pipe to engine with flexible connector.
- e. Gaseous Fuel Connections:
 - 1. Connect fuel piping to engines with a gate valve and union and flexible connector.
 - 2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.
 - 3. Vent gas pressure regulators outside building a minimum of 60 inches (1500 mm) from building openings.
- f. Ground equipment according to Section 16060, Grounding and Bonding.
- g. Connect wiring according to Section 16120, Low-Voltage Electrical Power Conductors and Cables. Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.
- h. Balance loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 <u>IDENTIFICATION</u>

- A. Identify system components according to Section 16075, Identification for Electrical Systems.
- B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

- a. Testing Agency:
 - 1. Engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
 - 3. Perform tests and inspections with the assistance of a factory-authorized service representative.
- b. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.
 - a. Visual and Mechanical Inspection:
 - 1) Compare equipment nameplate data with drawings and specifications.
 - 2) Inspect physical and mechanical condition.

- 3) Inspect anchorage, alignment, and grounding.
- 4) Verify the unit is clean.
- b. Electrical and Mechanical Tests:
 - 1) Perform insulation-resistance tests in accordance with IEEE 43.
 - a) Machines larger than 200 hp (150 kW). Test duration shall be 10 minutes. Calculate polarization index.
 - b) Machines 200 hp (150 kW) or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.
 - 2) Test protective relay devices.
 - 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 5) Perform vibration test for each main bearing cap.
 - 6) Verify correct functioning of the governor and regulator.
- 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
- 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for fullcharging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
- 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and floatcharging conditions.
- 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- 6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
- 7. Exhaust Emissions Test: Comply with applicable government test criteria.
- 8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
- 9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
- 10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at two locations 25 feet (8 m) from edge of the generator enclosure, and compare measured levels with required values.

- c. Coordinate tests with tests for transfer switches and run them concurrently.
- d. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- e. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
- f. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- g. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- h. Remove and replace malfunctioning units and retest as specified above.
- i. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- j. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- k. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 <u>DEMONSTRATION</u>

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

END OF SECTION

SECTION 16231 PORTABLE ENGINE GENERATOR

PART 1 - GENERAL

1.1 <u>RELATED DOCUMENTS</u>

a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 <u>SUMMARY</u>

- a. This Section includes packaged engine-generator sets for standby systems power supply with the following features:
 - 1. Engine.
 - 2. Gas fuel system.
 - 3. Control and monitoring.
 - 4. Generator overcurrent and fault protection.
 - 5. Generator, exciter, and voltage regulator.
 - 6. Load bank.
 - 7. Outdoor generator-set enclosure.
 - 8. Vibration isolation devices.

1.3 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Include thermal damage curve for generator.
 - 3. Include time-current characteristic curves for generator protective device.
 - 4. Include fuel consumption in cubic feet per hour (cubic meters per hour) at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
 - 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
 - 6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95 deg F (35 deg C), 80 deg F (27 deg C), 70 deg F (21 deg C), and 50 deg F (10 deg C). Provide drawings showing requirements and limitations for location of air intake and exhausts.
 - 7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
- b. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, and required clearances.

- 1. Include plans and elevations for engine generator and other components specified.
- 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Identify fluid drain ports and clearance requirements for proper fluid drain.
- 4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
- 5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
- 6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.
- 7. Generator Supplier shall submit a motor starting analysis based on the one line diagram shown in the drawings.

1.4 INFORMATIONAL SUBMITTALS

- a. Qualification Data: For Installer, manufacturer, and testing agency.
- b. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, supplied enclosure, external silencer, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- c. Source Quality-Control Reports: Including, but not limited to, the following:
 - 4. Certified summary of prototype-unit test report.
 - 5. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 - 6. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
 - 7. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 - 8. Report of sound generation.
 - 9. Report of exhaust emissions showing compliance with applicable regulations.
 - 10. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- d. Field quality-control reports.
- e. Warranty: For special warranty.

1.5 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01770 "Project Closeouts" include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.

1.6 <u>MATERIALS MAINTENANCE SUBMITTALS</u>

- a. Furnish extra materials described below that match products installed and that are packaged with protective covering in a single container for storage and identified with labels describing contents.
 - 1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
 - 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
 - 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
 - 4. Tools: Each tool listed by part number in operations and maintenance manual.

1.7 **QUALITY ASSURANCE**

- a. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
- b. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- c. Source Limitations: Obtain packaged generator set and auxiliary components through one source from a single manufacturer.
- d. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- e. Comply with NFPA 37.
- f. Comply with NFPA 70.
- g. Comply with UL 2200.
- h. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

- i. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- j. Testing Agency Qualifications: Accredited by NETA
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 **PROJECT CONDITIONS**

- a. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner and Engineer no fewer than ten working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's or Engineer's written permission.
- b. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature Minus 15 to plus 40 deg C.
 - 2. Relative Humidity: 0 to 95 percent.
 - 3. Altitude: Sea level to 1000 feet (300 m)

1.9 <u>COORDINATION</u>

a. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.10 WARRANTY

- a. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five-year warranty from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

a. Initial Maintenance Service: Beginning at Substantial Completion, provide Twelve months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 <u>MANUFACTURERS</u>

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Kohler Co.; Generator Division.
 - 2. Onan/Cummins Power Generation; Industrial Business Group
 - 3. Caterpillar; Engine Div.
 - 4. Or equal

2.2 PORTABLE ENGINE GENERATOR SET

- a. The generator set and its components shall be prototype-tested, factory-built, and production-tested.
- b. Generator set features:
 - 1. Unit-mounted radiator with 50_C (122_F) ambient air capability at the prime rating.
 - 2. Wound field excitation system.
 - 3. Brushless, rotating-field alternator without a selector switch.
- c. Engine features:
 - 4. Heavy-duty air cleaner with air restrictor indicator.
 - 5. The generator set engine shall be certified by the Environmental Protection Agency (EPA) to conform to Tier 4 Final nonroad emissions regulations.
 - 6. Uses cooled Exhaust Gas Regeneration (EGR) and Diesel Oxidation Catalyst (DOC) to meet Tier 4 Final without a Diesel Particulate Filter (DPF).
 - 7. Lockable battery disconnect switch.
- d. Enclosure/tank features:
 - 1. Durable steel, sound-attenuating housing with quiet operation of 67 dB(A) log average @ 7 m (23 ft.) with full load at the prime rating.
 - 2. Stainless steel hinges and lockable latches on doors.
 - 3. 125% environmental containment basin for oil and coolant. d 110% secondary containment tank for fuel.
 - 4. Single-point lifting eye and four-point tie down system.
 - 5. Subbase fuel tank for 24-hour run time with full load at prime rating (minimum).
- e. Customer connection panel features:
 - 1. Provide controller with potted circuitry for protection from vibration and debris.
 - 2. Externally mounted, recessed emergency stop switch.
 - 3. Adjustable trip main line circuit breaker.
 - 4. 1 load lug per phase # 6-350MCM, 400amp.
 - 5. Remote start/stop capabilities.

6. Shore power connection points to front of junction box for block heater, battery charger, and battery heater.

2.3 <u>ALTERNATOR</u>

	a.	Туре	4-Pole, Rotating-Field
	b.	Exciter type	Brushless, Wound-Field
	c.	Leads: quantity, type	12, Reconnectable 6, 600 Volt
	d.	Voltage regulator	Solid State, Volts/Hz
	e.	Insulation:	NEMA MG1
		Material	Class H
		Temperature rise	150_C, Standby
	f.	Bearing: quantity, type	1, Sealed
	g.	Amortisseur windings	Full
	h.	Voltage regulation, no-load to full-load	+/- 0.5%
	i.	One-step load acceptance	100% of Rating
	j.	Unbalanced load capability	100% of Rated Standby Current
2.4		ENGINE	

a.	Engine: type	4-Cycle, Turbocharged
b.	Cylinder arrangement	3 Inline
c.	Displacement, L (cu. in.)	1.9 (115.9)
d.	Bore and stroke, mm (in.)	88 x 102 (3.46 x 4.01)
e.	Compression ratio	17.0:1
f.	Rated rpm	1800
g.	Max. power at rated rpm, kW (HP)	37 (49)
h.	Valve (exhaust) material	Stainless Steel
i.	Governor type	Electronic
j.	Frequency regulation, no-load to full-load	Isochronous

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- k. Frequency regulation, steady state +/- 0.28%
- 1. Air cleaner type, all models Dry

2.5 <u>CUSTOMER CONNECTION PANEL</u>

- a. Viewable generator set controller with security cover
- b. Emergency stop switch
- c. Shore power connector, 120 V, 15 amp (for battery charger(s) and battery heater)
- d. Shore power connector, 120 V, 15amp (for block heater)
- e. Remote start connection
- f. Main line circuit breaker
 - 1. Reconnectable and selector switch models: Rating 150 amps, field adjustable based on voltage selected
- g. Available options
 - 1. Two 15-amp, 120 V, 1 phase, GFCI duplex receptacles (includes circuit breakers)
 - 2. Color-coded camlock connectors

2.6 <u>TRAILER</u>

- a. Single-axle trailer with electric brake system and battery back-up breakaway system.
- b. DOT compliant per current specifications, at the time of trailer manufacture.
- c. 2 5/16 in. ball hitch coupler with adaptability for an optional Lunette eye.
- d. Lockable utility tool box with bottle jack, lug wrench, and fire extinguisher. Common key to enclosure.
- e. Running lights with 7-wire harness and connector.
- f. Front tongue jack.
- g. Rear stabilizer trailer jacks.
- h. Weight bearing fenders up to 227 kg (500 lbs.)
- i. Axel Rating: Single, 2266 kg (4995 lb.)
- j. Tires: ST225/75R15 LRD with 1152 kg (2540 lb.) load rating

k. Wheels: Steel, 15 x 6, 6-bolt

2.7 <u>CABLE</u>

a. Provide 30 feet, 4 # 1/0's 500 W Cable with 200-amp twist lock receptacles on cable.

2.8 <u>SOURCE QUALITY CONTROL</u>

- a. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.
- b. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 - 2. Test generator, exciter, and voltage regulator as a unit.
 - 3. Full load run.
 - 4. Maximum power.
 - 5. Voltage regulation.
 - 6. Transient and steady-state governing.
 - 7. Single-step load pickup.
 - 8. Safety shutdown.
 - 9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
 - 10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 <u>EXAMINATION</u>

a. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

3.2 <u>PREPARATION</u>

- a. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Engineer no fewer than two working days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Engineer's written permission.

3.3 <u>INSTALLATION</u>

- a. Comply with NECA 1 and NECA 404.
- b. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- c. Equipment Mounting:
 - 1. Install packaged engine generators on trailer in accordance with manufacturer's recommendations.
- d. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

3.4 <u>IDENTIFICATION</u>

- A. Identify system components according to Section 16075, Identification for Electrical Systems.
- B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.5 FIELD QUALITY CONTROL

- a. Testing Agency:
 - 1. Engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
 - 3. Perform tests and inspections with the assistance of a factory-authorized service representative.
- b. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.
 - a. Visual and Mechanical Inspection:
 - 1) Compare equipment nameplate data with drawings and specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect alignment, and grounding.
 - 4) Verify the unit is clean.
 - b. Electrical and Mechanical Tests:

- 1) Perform insulation-resistance tests in accordance with IEEE 43.
 - a) Machines larger than 200 hp (150 kW). Test duration shall be 10 minutes. Calculate polarization index.
 - b) Machines 200 hp (150 kW) or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.
- 2) Test protective relay devices.
- 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
- 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
- 5) Perform vibration test for each main bearing cap.
- 6) Verify correct functioning of the governor and regulator.
- 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
- 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for fullcharging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
- 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and floatcharging conditions.
- 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- 6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
- 7. Exhaust Emissions Test: Comply with applicable government test criteria.
- 8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
- 9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
- 10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at two locations 25 feet (8 m) from edge of the generator enclosure, and compare measured levels with required values.
- c. Coordinate tests with tests for transfer switches and run them concurrently.

- d. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- e. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
- f. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- g. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- h. Remove and replace malfunctioning units and retest as specified above.
- i. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- j. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- k. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 <u>DEMONSTRATION</u>

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

END OF SECTION

SECTION 16260 ADJUSTABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.1 <u>RELATED DOCUMENTS</u>

a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 <u>SUMMARY</u>

a. Section includes separately enclosed, preassembled, combination adjustable frequency drive (AFD), rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.3 <u>DEFINITIONS</u>

- a. CPT: Control power transformer.
- b. EMI: Electromagnetic interference.
- c. LED: Light-emitting diode.
- d. NC: Normally closed.
- e. NO: Normally open.
- f. OCPD: Overcurrent protective device.
- g. PID: Control action, proportional plus integral plus derivative.
- h. RFI: Radio-frequency interference.
- i. AFD/VFD/AFD: Variable-frequency motor controller.

1.4 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type and rating of AFD indicated.
 - 1. Include dimensions and finishes for AFDs.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 3. Include data and calculations to support the minimum SCCR specified.
- b. Shop Drawings: For each AFD indicated.

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- 1. Include mounting and attachment details.
- 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Include diagrams for power, signal, and control wiring.
- 4. Include marking data per NEC 70, Article 409.110

1.5 INFORMATIONAL SUBMITTALS

- a. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Required working clearances and required area above and around AFDs.
 - 2. Show AFD layout and relationships between electrical components and adjacent structural and mechanical elements.
 - 3. Show support locations, type of support, and weight on each support.
 - 4. Indicate field measurements.
- b. Product Certificates: For each AFD from manufacturer.
- c. Source quality-control reports.
- d. Field quality-control reports.
- e. Sample Warranty: For special warranty.

1.6 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For AFDs to include in emergency, operation, and maintenance manuals, including the following:
 - 1. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and motor-circuit protector trip settings.
 - 2. Manufacturer's written instructions for setting field-adjustable overload relays.
 - 3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
 - 4. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
 - 5. Retain one or both subparagraphs below for projects with multiple sizes and types of VFCs, and when retaining motor-running overload protection in "Bypass Systems" Article. See Evaluations for discussion.

- 6. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.
- 7. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.7 <u>MAINTENANCE MATERIAL SUBMITTALS</u>

- a. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
 - 3. Indicating Lights: Two of each type and color installed.
 - 4. Auxiliary Contacts: Furnish Two spare(s) for each size and type of magnetic controller installed.
 - 5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 DELIVERY, STORAGE, AND HANDLING

- a. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.
- b. Product Selection for Restricted Space: Drawings indicate maximum dimensions for AFDs, including clearances between AFDs, and adjacent surfaces and other items.

1.9 WARRANTY

- a. Special Warranty: Manufacturer agrees to repair or replace AFDs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 <u>MANUFACTURERS</u>

- Manufacturers: Subject to compliance with requirements, provide products by one of the following
 Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Business Unit.
 - 2. Rockwell Automation, Inc; Allen-Bradley Brand.

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- 3. Schneider Electric USA, Inc.
- 4. Siemens Energy & Automation, Inc.
- 5. Or Equal

2.2 <u>SYSTEM DESCRIPTION</u>

- a. General Requirements for AFDs:
 - 1. AFDs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with NEMA ICS 7, NEMA ICS 61800-2, UL 409 and UL 508A.
 - 3. The AFD shall have a single phase input and have adequate capacity for proper load.
- b. Application: AFDs shall be variable torque unless otherwise indicated on the drawings.
- c. AFD Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.
 - 1. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1
 - 2. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.
- d. Design and Rating: Match load type, such as pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- e. Output Rating:
 - 1. Variable Torque: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
- f. Unit Operating Requirements:
 - 1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of AFD input voltage rating.
 - 2. Input AC Voltage Unbalance: Not exceeding 5 percent.
 - 3. Input Frequency Tolerance: Plus or minus 3 percent of AFD frequency rating.
 - 4. Minimum Efficiency: 97 percent at 60 Hz, full load.
 - 5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
 - 6. Minimum Short-Circuit Current (Withstand) Rating: [to match the AIC of the servicing over current device.
 - 7. Ambient Temperature Rating: Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
 - 8. Humidity Rating: Less than 95 percent (noncondensing).
 - 9. Vibration Withstand: Comply with NEMA ICS 61800-2.
 - 10. Overload Capability: 1.1 (variable torque) or 1.5 (constant torque) times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
 - 11. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
 - 12. Speed Regulation: Plus or minus 5 percent.
 - 13. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.

- 14. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.
- g. Inverter Logic: Microprocessor based, 16 bit, isolated from all power circuits.
- h. Isolated Control Interface: Allows AFDs to follow remote-control signal over a minimum 40:1 speed range.
 - 1. Signal: Electrical
- i. Internal Adjustability Capabilities:
 - 1. Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3. Acceleration: 0.1 to 999.9seconds.
 - 4. Deceleration: 0.1 to 999.9 seconds.
 - 5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- j. Self-Protection and Reliability Features:
 - 1. Surge Suppression: Field-or Factory mounted surge suppressors UL 1449 SPD, Type 2 (installed when shown on the One Line Diagram).
 - 2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
 - 3. Under- and overvoltage trips.
 - 4. Inverter overcurrent trips.
 - 5. AFD and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring AFDs and motor thermal characteristics, and for providing AFD overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
 - 6. Critical frequency rejection, with three selectable, adjustable deadbands.
 - 7. Instantaneous line-to-line and line-to-ground overcurrent trips.
 - 8. Loss-of-phase protection.
 - 9. Reverse-phase protection.
 - 10. Short-circuit protection.
 - 11. Motor-overtemperature fault.
- k. "Automatic Reset/Restart" and "Power-Interruption Protection" paragraphs below are mutually exclusive in the same VFC. Retain both paragraphs if required for separate VFCs, and indicate on Drawings where each type is required.
- Automatic Reset/Restart: The drive shall be configured such that it automatically resets on return
 of power after a power loss. In addition, the drive shall be configured for manual reset of faults
 from the fault reset pushbutton or remotely from the control system.Power-Interruption Protection:
 To prevent motor from re-energizing after a power interruption until motor has stopped, unless
 "Bidirectional Autospeed Search" feature is available and engaged.
- m. Bidirectional Autospeed Search: Capable of starting AFD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.
- n. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

- o. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
- p. Integral Input Disconnecting Means and OCPD: UL 489, molded-case switch, with power fuse block and current-limiting fuses with pad-lockable, door-mounted handle mechanism.
 - 1. Disconnect Rating: Not less than 125 percent of NFPA 70 motor full-load current rating or AFD input current rating, whichever is larger.
 - 2. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
 - 3. [NC] [NO] alarm contact that operates only when circuit breaker has tripped.

2.3 <u>PERFORMANCE REQUIREMENTS</u>

a. Seismic Performance: AFDs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated AFDs shall be tested and certified by an NRTL as meeting the ICC-ES AC 156 test procedure requirements.

2.4 <u>CONTROLS AND INDICATION</u>

- a. Status Lights: Door-mounted LED indicators displaying the following conditions (lights to have a push to test function):
 - 1. Run (Red).
 - 2. Stop (Green)
 - 3. Fault (Amber)
- b. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
- c. Provide a HAND –OFF AUTO selector switch for each AFD.
- d. Historical Logging Information and Displays:
 - 1. Total run time.
 - 2. Fault log, maintaining last four faults with time and date stamp for each.
- e. Control Signal Interfaces:
 - 1. Electric Input Signal Interface:
 - a. A minimum of two programmable analog inputs: 4- to 20-mA dc
 - b. A minimum of six multifunction programmable digital inputs.
 - 2. Output Signal Interface: A minimum of one programmable analog output signal(s) 4- to 20-mA dc, which can be configured for any of the following:
 - a. Output frequency (Hz).
 - 3. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

- a. Motor running.
- b. Fault and warning indication (overtemperature or overcurrent)
- f. Facility Control System Interface: Factory-installed hardware and software shall interface with Facility Control System to monitor, control, display, and record data for use in processing reports. AFD settings shall be retained within AFD's nonvolatile memory.
 - 1. Communication Interface: Comply with Industrial Ethernet

2.5 LINE CONDITIONING AND FILTERING

- a. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering & active harmonic correction, as required, to limit total harmonic distortion at the defined point of common coupling to meet IEEE 519 recommendations. The AFD manufacture shall also provide all required filtering and active harmonic correction equipment to guarantee that the AFDs will operate on the Standby Generator System (as shown on the One Line Diagram). On projects that have an Standby Generator, the point of common coupling shall be defined as the generator transfer switch.
- b. As a minimum all drives shall be provided with a 5% line reactor.
- c. On projects without an Emergency Generator, the point of common coupling shall be defined as the secondary side of the Utility Company Transformer.
- d. Typically, if the separation between motor and VFC is less than 100 feet (30 m), the motor is designed for use with VFC, low carrier frequencies are specified, or all three, then output filtering may not be an issue. However, if distances are more than 100 feet (30 m) and high carrier frequencies are being used, controller output voltage can exceed motor pulse-withstand capability. Consult motor and VFC manufacturers to determine need for, and options available for, conditioning output voltage. Options may include line inductors, dV/dT filters, output reactors, and motor termination filters. Insert requirements in "Output Filtering" Paragraph below. See "Motor and VFC Compatibility" Article in the Evaluations for additional guidance.
- e. Output Filtering: Provide Output Filtering per the AFD manufacturer's recommendations based on the motor lead lengths. Output filtering is required on all motor leads greater than 150 ft.

2.6 <u>ENCLOSURES</u>

- a. AFD Enclosures: NEMA 250, to comply with environmental conditions at installed location.
 - 1. Dry and Clean Indoor Locations: Type 1
 - 2. Outdoor Locations: Type 4X stainless steel with integral AC units.
 - 3. Wet Areas: Type 4Xstainless steel with integral AC units.
 - 4. Other Wet or Damp Indoor Locations: Type 4X stainless steel with integral AC units
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

2.7 <u>ACCESSORIES</u>

- a. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in AFD enclosure cover unless otherwise indicated.
 - 1. Push Buttons: Unguarded.
 - 2. Pilot Lights: Push to test, and LED
 - 3. All pilot devices to be 30 mm, heavy duty, oil tight (housing to match AFD enclosure)
 - 4. Selector Switches: Rotary type.
 - 5. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
- b. Cooling Fan and Exhaust System: For NEMA 250, NEMA 1 UL 508 component recognized: Supply fan, with intake and exhaust grills and filters 120 -V ac; obtained from integral CPT. (Provide thermostat control or interlock with drive operation)
- c. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.
- d. Spare control-wiring terminal blocks; wired.

2.8 SOURCE QUALITY CONTROL

- a. Testing: Test and inspect AFDs according to requirements in NEMA ICS 61800-2.
 - 1. Test each AFD while connected to its specified motor
 - 2. Verification of Performance: Rate AFDs according to operation of functions and features specified.
- b. AFDs will be considered defective if they do not pass tests and inspections.
- c. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 <u>EXAMINATION</u>

- a. Examine areas, surfaces, and substrates to receive AFDs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- b. Examine AFD before installation. Reject AFDs that are wet, moisture damaged, or mold damaged.
- c. Examine roughing-in for conduit systems to verify actual locations of conduit connections before AFD installation.

- d. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work
- e. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 <u>INSTALLATION</u>

- a. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 16070, Hangers and Supports for Electrical Systems.
- b. Floor-Mounting Controllers: Install AFDs on 4-inch (100-mm) nominal thickness concrete base. Comply with requirements for concrete.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- c. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- d. Install fuses in each fusible-switch AFD.
- e. Install fuses in control circuits if not factory installed.
- f. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.
- g. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- h. Comply with NECA 1.

3.3 <u>CONTROL WIRING INSTALLATION</u>

- a. Install wiring between AFDs and control panel. Comply with requirements in Section 16120, " Low-Voltage Electrical Power Conductors and Cables."
- b. Bundle, train, and support wiring in enclosures.
- c. Connect selector switches and other automatic-control devices where applicable.

1. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor-overload protectors.

3.4 <u>IDENTIFICATION</u>

- a. Identify AFDs, components, and control wiring. Comply with requirements for identification specified in Section 16075 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each AFD with engraved nameplate.
 - 3. Label each enclosure-mounted control and pilot device.
- b. Operating Instructions: Frame printed operating instructions for AFDs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of AFD units.

3.5 FIELD QUALITY CONTROL

- a. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each AFD element, bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- b. Tests and Inspections:
 - 1. Inspect AFD, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Test insulation resistance for each AFD element, component, connecting motor supply, feeder, and control circuits.
 - 3. Test continuity of each circuit.
 - 4. Verify that voltages at AFD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify [Engineer before starting the motor(s).
 - 5. Test each motor for proper phase rotation.
 - 6. Perform tests according to the Inspection and Test Procedures for Adjustable Frequency Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Perform the following infrared (thermographic) scan tests and inspections, and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each AFD. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each AFD 11 months after date of Substantial Completion.

- c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- 9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- c. AFDs will be considered defective if they do not pass tests and inspections.
- d. Perform Harmonic Distortion Testing at the point of common coupling defined in this specification and verify compliance with IEEE 519 guidelines.
- e. Prepare test and inspection reports, including a certified report that identifies the AFD and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.6 <u>STARTUP SERVICE</u>

- a. Perform startup service.
 - 1. Complete installation and startup check according to manufacturer's written instructions.

3.7 <u>ADJUSTING</u>

- a. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- b. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

3.8 <u>PROTECTION</u>

- a. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.
- b. Replace AFDs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.9 <u>DEMONSTRATION</u>

a. Train Owner's maintenance personnel to adjust, operate, reprogram, and maintain AFDs.

END OF SECTION

SECTION 16280 LOW-VOLTAGE SURGE PROTECTION

PART 1 - GENERAL

1.1 <u>SUMMARY</u>

a. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 <u>DEFINITIONS</u>

- a. I_n: Nominal discharge current.
- b. MCOV: Maximum continuous operating voltage.
- c. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- d. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- e. OCPD: Overcurrent protective device.
- f. SCCR: Short-circuit current rating.
- g. SPD: Surge protective device.
- h. VPR: Voltage protection rating.

1.3 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.4 INFORMATIONAL SUBMITTALS

- a. Field quality-control reports.
- b. Sample Warranty: For manufacturer's special warranty.

1.5 <u>CLOSEOUT SUBMITTALS</u>

a. Maintenance Data: For SPDs to include in maintenance manuals.

1.6 <u>WARRANTY</u>

- a. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

1.7 <u>MANUFACTURERS</u>

- a. Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB France. (Current Technology)
 - 2. Advanced Protection Technologies Inc. (APT).
 - 3. Eaton Corporation, (Innovative Technology.)
 - 4. Emerson Electric Co. (Liebert)
 - 5. Schneider Electric Industries SAS.
 - 6. Siemens Industry, Inc.
 - 7. Surge Suppression, Inc
 - 8. Total Protection Solutions
 - 9. DEHN Inc.
 - 10. Or Equal

PART 2 - PRODUCTS

2.1 <u>GENERAL SPD REQUIREMENTS</u>

- a. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- b. Comply with NFPA 70.
- c. All Surge Protective Devices (SPDs) shall be tested and <u>listed</u> to the latest edition of <u>ANSI/UL 1449-2006</u>. "Manufactured in accordance with UL 1449" is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification
- d. MCOV of the SPD shall be the nominal system voltage.
- e. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly.
- f. Provide SPDs with the following modes of protection:
 - 1. Single-Phase, Three Wire Systems: 6 Modes: L1-L2, L2-N, N-L1, L1-G, L2-G, N-G

2.2 <u>PANELBOARD</u>

- a. SPDs: Comply with UL 1449, Type 2.
 - 1. Include LED indicator lights for power and protection status.
 - 2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 - 3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status
- b. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- c. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 600V.
 - 2. Line to Ground: 600V.
 - 3. Neutral to Ground: 600V.
 - 4. Line to Line: 1000V.
- d. SCCR: Equal or exceed 100K AIC min or per the one-line diagram
- e. Nominal Discharge Current (I_n) Rating: 20 kA
- f. Sinewave Tracking/Frequency Responsive Capability.
 - 1. SPDs installed to protect Panelboards sensitive electronic equipment shall utilize voltage independent, frequency responsive dedicated Sinewave Tracking circuitry to mitigate the effects of switching or ringing surges.
 - a. Sensitive Electronic Equipment shall include, but is not limited to:
 - 1) Variable Frequency Controllers
 - 2) Lighting with Electronic Ballasts
 - 2. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking.
 - 3. Devices with Sinewave Tracking circuitry shall be tested in accordance with the latest edition of IEEE C62.41.2 for a Category A Ring Wave (2000 volt 67 amp ring wave)
 - a. <u>The maximum</u> amplitude shall be less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient.

2.3 <u>ENCLOSURES</u>

- a. Indoor Enclosures: NEMA 250, Type 1.
- b. Outdoor Enclosures: NEMA 250, Type 4X.

2.4 <u>CONDUCTORS AND CABLES</u>

a. Power Wiring: Same size as SPD leads, complying with Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 <u>INSTALLATION</u>

- a. Comply with NECA 1.
- b. Install an OCPD or disconnect as required to comply with the UL listing of the SPD. DO NOT WIRE DIRECT TO PANEL BUS
- c. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- d. Use crimped connectors and splices only. Wire nuts are unacceptable.
- e. Wiring:
 - 1. Power Wiring: Comply with wiring methods in Section 16120 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Controls: Comply with wiring methods in Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- a. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
 - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- b. An SPD will be considered defective if it does not pass tests and inspections.
- c. Prepare test and inspection reports.

3.3 <u>STARTUP SERVICE</u>

- a. Complete startup checks according to manufacturer's written instructions.
- b. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- c. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION

SECTION 16290 BASIC CONTROL SYSTEM MATERIALS AND METHODS

PART 1 - GENERAL

1.01 CODES AND STANDARDS

- a. All electrical work to be performed and all materials to be furnished shall be in accordance with the Contract Drawings and Specifications, to the satisfaction of the Engineer, and the requirements of the following codes, regulations, and specifications:
 - 1. National Electrical Code (NEC)
 - 2. National Fire Protection Association (NFPA)
 - 3. National Electrical Manufacturer's Association (NEMA)
 - 4. Institute of Electrical and Electronic Engineers (IEEE)
 - 5. American National Standards Institute (ANSI)

1.02 <u>SUBMITTALS</u>

- a. The submittal requirements listed in this section are additional requirements to those listed in other sections of these specifications and do not release the Contractor from any requirements listed in other sections.
- b. Submit catalog cuts and shop drawings for materials and equipment in conformance with the requirements of Section 01330, Submittal Procedures. Electrical shop drawings shall include:
 - 1. Terminal identification diagrams and schedules.
 - 2. Point-to-point interconnection diagrams.
 - 3. Single line and elementary wiring diagrams, for all power, signal, control and lighting systems, together with panel layout drawings.
 - 4. Actual details of conduit installation.
- c. Submit final As-Built Drawings in conformance with the requirements of Section 01330, Submittal Procedures . The As-Built Drawings shall depict the actual installation with all items clearly identified, all dimensions exactly as installed, and all details correct.
- d. The electrical section of the As-Built Drawings shall consist of one-line diagrams of the complete installation, one-line and relay diagrams of the power systems, elementary diagrams of power control and signal circuits, complete connection and interconnection wiring diagrams for the entire installation, including items furnished under other contracts, conduit schedules and panelboard schedules.
- e. Submit Operating and Maintenance Manuals containing detailed information for all equipment and associated control systems furnished and installed under this Contract. O&M Manuals for the Contract shall meet all requirements of Section 01330, Submittal Procedures .
- f. Each O&M Manual shall include:
- 1. A complete set of reduced-size prints of the final As-Built Drawings.
- 2. A complete list of all relay settings, and all control and alarm point settings.
- 3. One copy of the manufacturer's spare parts list for all equipment furnished.

1.03 <u>SUBSTITUTIONS</u>

a. Wherever the Electrical Contractor proposes to substitute equipment, he shall submit three sets of certified manufacturer's prints and one set of Engineering data for the equipment he proposes to furnish along with one set of manufacturer's prints and one set of Engineering data for the specified equipment, for evaluation and preliminary approval by the Engineer. Determination of acceptability by the Engineer shall be final. Samples may be requested by the Engineer for evaluation.

1.04 <u>MATERIALS</u>

- a. No materials of any kind shall be used that have not been approved by the Underwriters Laboratories, Inc., where UL provides such service, and each piece of equipment shall have marked thereon, where it can readily be observed, the name or trademark of the manufacturer.
- b. Materials and equipment shall be the best of their several kinds and all work shall be performed in a neat, substantial and workmanlike manner, to the satisfaction of the Engineer.

1.05 DEFECTIVE MATERIALS AND EQUIPMENT

a. Defective material and equipment or materials and equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting the approval of the Engineer. All materials and workmanship shall be of the best quality and all work done in a thorough manner in strict accordance with the rules and regulations of the American Insurance Association (formally the National Board of Fire Underwriters,) the state, and local authorities and the electric company that will furnish the power.

1.06 MATERIAL AND EQUIPMENT INSTALLATION

- a. All items shall be installed in accordance with the manufacturer's recommendations. The Contractor shall furnish and install all material and hardware required for mounting and to provide a complete and functional installation, at no additional cost to the Owner.
- b. Mounting hardware shall be stainless steel, unless otherwise noted. Field mounted instruments shall be mounted on pipe stands or mounting brackets which will allow easy removal. Supports shall be attached to concrete surfaces with wedge anchors and stainless steel bolts.

1.07 <u>GROUNDING</u>

a. All equipment furnished and/or installed under this Contract shall be grounded in accordance with the latest requirements of the National Electrical Code.

1.08 <u>CALIBRATION</u>

a. All instrumentation and control devices, furnished under this Contract, shall be calibrated by competent, qualified technicians prior to final acceptance. A copy of the calibration data shall be submitted for approval.

1.09 <u>IDENTIFICATION</u>

- a. Nameplates shall be provided as required. Nameplates shall be black laminated plastic with white center, fastened with stainless steel screws.
- b. The size and shape of nameplates and lettering shall be in pleasing proportion for each specified location.

1.10 WARNING SIGNS

a. Furnish all warning signs in conformance with NEC code and OSHA regulations.

1.11 CLEANING AND TOUCH-UP PAINTING

a. The premises shall be kept free from accumulation of waste material and rubbish. Upon completion of work, the Contractor shall remove materials, scraps, and debris from the site. Scratches, scrapes, or chips in interior or exterior surfaces of devices shall be touched-up with finishes matching as nearly as possible the type and color of the original finish.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECTUTION

Not Used.

END OF SECTION

SECTION 16330 TRANSFER SWITCHES

PART 1 - GENERAL

1.1 <u>SUMMARY</u>

- a. Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches.
 - 2. Manual transfer switches.

1.2 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- b. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
 - 1. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.3 INFORMATIONAL SUBMITTALS

- a. Qualification Data: For manufacturer.
- b. Field quality-control reports.

1.4 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals, including the following:
 - 1. Features and operating sequences, both automatic and manual.
 - 2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.5 <u>QUALITY ASSURANCE</u>

a. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

- b. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches, manual transfer switches, and remote annunciators, through one source from a single manufacturer.
- c. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. Comply with NEMA ICS 1.
- e. Comply with NFPA 70.
- f. Comply with NFPA 99.
- g. Comply with NFPA 110.
- h. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.6 <u>FIELD CONDITIONS</u>

- a. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:
 - 1. Notify Engineer and Owner no fewer than two days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Engineers and Owner's written permission.

1.7 <u>COORDINATION</u>

a. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 03005 "Structural Concrete."

PART 2 - PRODUCTS

2.1 <u>MANUFACTURED UNITS</u>

- a. Contactor Transfer Switches:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Caterpillar; Engine Div.
 - b. Emerson; ASCO Power Technologies, LP.
 - c. GE Zenith Controls.
 - d. Kohler Power Systems; Generator Division.
 - e. Onan/Cummins Power Generation; Industrial Business Group.
 - f. Russelectric, Inc.
 - g. or Equal.

2.2 <u>GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS</u>

- a. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- b. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 - 1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
- c. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- d. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- e. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electricmotor-operated mechanism, mechanically and electrically interlocked in both directions.
- f. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
- g. Neutral Terminal: Solid and fully rated, unless otherwise indicated.
- h. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater. (Heaters shall be powered from the load size of the switches. No external power sources shall be required. Fuses shall be provided per the NEC and UL.)
- i. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.
- j. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 16075 "Identification for Electrical Systems."
 - 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- k. Enclosures:

1. Indoor NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 <u>AUTOMATIC TRANSFER SWITCHES</u>

- a. Comply with Level 1 equipment according to NFPA 110.
- b. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- c. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.
- d. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- e. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- f. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
- g. Automatic Transfer-Switch Features:
 - 1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 - 2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
 - 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
 - 4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
 - 5. Test Switch: Simulate normal-source failure.
 - 6. Switch-Position Pilot Lights: Indicate source to which load is connected.
 - 7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and standby-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

- b. Standby Power Supervision: Red light with nameplate engraved "Emergency Source Available."
- 8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
- 9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- 10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
- 11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
- 12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.

2.4 MANUAL TRANSFER SWITCHES

- a. Operation: Manually transferring load in either direction with either or both sources energized.
- b. Double-Throw Switching Arrangement: Incapable of being connected to both sources at the same time during the switching process.

2.5 SOURCE QUALITY CONTROL

a. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 <u>INSTALLATION</u>

- a. Identify components according to Section 16075 "Identification for Electrical Systems."
- b. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 <u>CONNECTIONS</u>

- a. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Provide raceway to accommodate required wiring.
- b. Ground equipment according to Section 16060 "Grounding and Bonding for Electrical Systems."
- c. Connect wiring according to Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- a. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- b. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Measure insulation resistance phase-to-phase and phase-to-ground with insulationresistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 - 4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
 - g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

- c. Coordinate tests with tests of generator and run them concurrently.
- d. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- e. Remove and replace malfunctioning units and retest as specified above.
- f. Prepare test and inspection reports.
- g. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 <u>DEMONSTRATION</u>

- a. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.
- b. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 16410 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Fusible switches.
 - 2. Enclosures.

1.2 <u>DEFINITIONS</u>

- a. NC: Normally closed.
- b. NO: Normally open.
- c. SPDT: Single pole, double throw.

1.3 <u>PERFORMANCE REQUIREMENTS</u>

- a. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- b. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

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1.5 INFORMATIONAL SUBMITTALS

- a. Qualification Data: For qualified testing agency.
- b. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- c. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- d. Manufacturer's field service report.

1.6 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals, including the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- a. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.8 **QUALITY ASSURANCE**

a. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

- b. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- c. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. Comply with NFPA 70.

1.9 <u>PROJECT CONDITIONS</u>

- a. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
 - 2. Altitude: Not exceeding 6600 feet (2010 m).

1.10 <u>COORDINATION</u>

a. Coordinate layout and installation of switches, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels in accordance with NFPA 70.

PART 2 - PRODUCTS

2.1 MOLDED-CASE CIRCUIT BREAKERS

- a. <u>Basis-of-Design Product</u>: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. ABB
 - 2. <u>Eaton Electrical Inc.; Cutler-Hammer Business Unit</u>.
 - 3. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 4. <u>Siemens Energy & Automation, Inc</u>.
 - 5. Square D; a brand of Schneider Electric.
 - 6. or equal.
- b. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- c. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- d. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, fieldadjustable trip setting.

- e. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- f. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- g. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.2 <u>ENCLOSURES</u>

- a. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Outdoor Locations: NEMA 250, Type 4X Stainless Steel unless specifically indicated otherwise on the drawings.

PART 3 - EXECUTION

3.1 <u>EXAMINATION</u>

- a. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 <u>INSTALLATION</u>

- a. Install individual wall-mounted circuit breakers with tops at uniform height unless otherwise indicated.
- b. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- c. Comply with NECA 1.

3.3 <u>IDENTIFICATION</u>

- a. Comply with requirements in Section 16075 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

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3.4 FIELD QUALITY CONTROL

- a. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- b. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- c. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- e. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- f. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 <u>ADJUSTING</u>

a. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 16420 ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 <u>SCOPE OF WORK</u>

- a. This section of the specification details the technical requirements for all preassembled control packages installed under this Contract as well as their interconnection. These control packages include items furnished under other sections of these specifications such as pumping and process equipment, heating and ventilating equipment and instrumentation devices. The Contractor shall note that certain items specified in this Section are to be provided under other sections of the Specifications. These items shall comply with the requirements of this Section, but shall be provided as part of the work included in the other Sections.
- b. It is not the intent of these Specifications to enumerate each and every method for achieving the control defined under the functional descriptions or each and every possible control or monitoring device. The Contractor is to carefully review all of the Contract Drawings and Specifications, undertake pre-bid discussions with the various manufacturers of the equipment to be installed in this project and make all such inquiries as may be needed to determine the intent of this section of the Specifications prior to preparing and submitting his bid price.
- c. The Contractor shall furnish and install equipment control panels where shown on the Contract Drawings.
- d. All control panels shall be entirely assembled, wired, and tested for proper operation by the manufacturer before the unit is shipped to the field for installation. Panel layout, component spacing, and drawings shall meet or exceed the requirements of the JIC standards. Only field installation and connections shall be required.
- e. The control panel manufacturer(s) shall be listed by Underwriters Laboratories as a manufacturer of Industrial Control Panels. As such, the manufacturer shall provide U.L. listing of each control panel. Each control panel shall bear an Underwriter's Laboratory serialized label as a listed Industrial Control Panel.

PART 2 PRODUCTS

2.01 SHOP DRAWING SUBMITTALS

- As a part of the requirements of this section of the Specifications, the Contractor shall provide eight (8) complete sets of shop drawings and descriptive literature, for each total package for the Engineer's review. No fabrication or installation of any control panel shall take place without such review.
- b. Shop drawings shall include the following:
 - 1. Complete descriptive information for all instruments, components, and devices including catalog numbers, catalog data, ratings, etc.
 - 2. Ladder type diagrams conforming to JIC Standard EGP-1-67 and JIC-EL-1-71.

- 3. Point to point connection diagrams showing the actual wiring within an enclosure.
- 4. Outline drawings for all panels and remote control station layouts (interior and exterior) indicating dimensions and the physical location of each component item.
- 5. Point to point field interconnection schedules or diagrams for all analog, digital, and discrete terminations including terminal numbers, wire numbers, conduit numbers, and equipment designations.
- c. Ladder type diagrams shall be developed by the Contractor and/or his Control System Supplier from the information contained in the Specifications and shown on the Contract Drawings. The Contractor/ Supplier shall review all of the Specifications and all of the Contract Drawings in order to ensure they are familiar with all of the requirements for each control system whether or not that control system is furnished by the Control System Supplier. Coordination between multiple equipment suppliers shall be the responsibility of the Contractor, who is to arrange for this function to be properly addressed.
- d. The Contractor shall furnish coordination drawings showing the interconnection and interfacing of all of the instrumentation, control devices, and components supplied by his various subcontractors and suppliers. These shall include, but not be limited to, the interfacing of the main control panel, local control panels, the local alarm panels, field devices, variable speed drives, motor operators, and process equipment. The drawings shall show the terminal numbers for wire terminations at each item of equipment and wire and conduit numbers assigned by Control System Coordinator for each interconnecting wire. The drawings shall be submitted to the Engineer prior to the start of any wiring. At the completion of the project, eight (8) sets revised drawings showing the actual terminal numbers, wire designations and color coding used by the installer shall be provided to the Owner for record purposes.
- e. The Contractor shall furnish the required reviewed drawings, wiring diagrams, and other related data to those subcontractors requiring such information to insure the timely and proper installation of this equipment.

2.02 DELIVERY, STORAGE AND HANDLING

a. The Contractor shall receive, store and properly protect the equipment from the elements to prevent corrosion or damage to component parts. The Contractor shall energize space heaters or make provisions to keep equipment dry and prevent internal condensation.

2.03 FIELD INSTALLATION

- a. The Contractor shall install equipment only when conditions of temperature and/or moisture can be maintained within limits of manufacturer's recommendations.
- b. Equipment cabinets may be installed at any stage of construction, provided openings are suitably protected to prevent entrance of water and foreign materials.
- c. The Contractor shall rig apparatus into place and set level and true in locations shown on the Drawings. After apparatus is set, remove lifting eyes and jacks, and deliver to Owner for his future use. Plug any shipping holes.

- d. The Contractor shall restore all factory finishes damaged in transit or installation; clean all exterior surfaces, vacuum clean interior spaces, remove all foreign material, keep space free from water, and continuously heated after installation.
- e. All field wiring between the equipment and control panels shall be furnished and interconnected as required. All electrical connections to terminal strips shall be made with compression type terminals.
- f. Conduit entrances to all panels and devices shall be sealed, after wire installation, to prevent condensation/moisture from entering the panel or device. Conduit entrances into field mounted panels and devices shall be made with threaded gasketed hubs from the bottom unless specifically approved by the equipment manufacturer and Engineer.
- g. All signal, control, and power wire runs shall be continuous from point to point. Where wires must be joined, only terminal strips shall be used. All wires carrying current not controlled by the main disconnect of the panel, shall be yellow in color. Yellow wire shall not be used for any other purpose except as a phase marker for 480 VAC.
- h. All wiring and piping shall be horizontal or vertical runs and groups of wires to common points shall be neatly harnessed and adequately supported. Wiring shall be run to one side of numbered terminal blocks mounted on the inside of the enclosures. The layout of the panel shall ensure the separation of internal and external wiring. All wires are to be identified at both ends by tubular sleeve type markers with numbering as shown on reviewed submittal drawings.

2.04 <u>CONTROL SYSTEM SUPPLIER</u>

- a. It is a requirement of these specifications that the Contractor designate one (1) Control System Supplier to act as the Control System Integrator. This Control Systems Integrator shall be responsible for all control packages, including calibration, start-up services, training, submittal, coordination of drawings from various manufacturers, and field service personnel. Supplemental design required by the Contractor or his Control System Integrator, as a result of approved alternate equipment and controls that meet the requirements of the functional descriptions but differ from the specified methods and devices shall be undertaken at no additional cost to the Owner.
- b. The Control System Integrator shall coordinate with other manufacturers the interconnection requirements among the various equipment including: adjustable frequency drives, motors, metering devices, transmitters, PLC, recorders, individual motor controllers, etc.
- c. The Control System Supplier shall provide all control panels and devices that are specified to be provided under this Section of the Specifications. The Control System Supplier shall be as approved by the Engineer.
- d. The services of a qualified representative from the manufacturer shall be provided to inspect the completed equipment installation, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment furnished. All instruments are to be calibrated to the manufacturers' stated accuracy. All necessary tools, test instruments or other devices required to perform a three-point calibration for each instrument are to be provided by the manufacturer's representative. Field calibration shall be supervised by the Control System Coordinator and witnessed by the Engineer or his representative. A minimum of two days notice of such calibration shall be given to the Engineer. A minimum of four days start up service shall be provided for each selected manufacturer of analog devices.

e. During the first year of operation (starting from date of provisional acceptance), each of the selected manufacturers shall check the calibration and operation of his equipment at intervals of 60 days, for any defects in operation of his area of responsibility to the satisfaction of the Owner. These services shall be included in the Contractor's price bid for the various items.

2.05 <u>CONTROL PANEL ENCLOSURES</u>

- a. Control panel enclosures shall be constructed of 11 gage (minimum) steel panels, with 10 gage (minimum), front panels. Front panels shall be free from flaws and seams and be adequately supported on welded steel frames.
- b. Panel faces shall be reinforced around instrument and graphic openings. Internal supports and bracing shall be provided as necessary.
- c. The interior of all panels shall be equipped with subpanels for the mounting of wireways, relays, timers, etc. Mounting of internal components shall not disturb or penetrate the exterior surface of the panel. Panels shall be equipped with drawing pockets. Hinges shall be 316 stainless steel with 316 stainless steel pins and be of the concealed full-length piano type. Exterior hardware shall be 316 stainless steel. Panel doors shall be gasketed and have returns of approximately 1 inch on all four sides.
- d. Control panel enclosures shall be provided with locking "T" handle operated 3-point door latches. Four keys shall be provided for each lock. Where multiple panels are provided for a particular service or a panel has more than one door, all of the locks shall be keyed alike.
- e. All panels to be located in dry, non-corrosive, interior locations shall meet NEMA 12 requirements. All panels to be located in damp, wet, corrosive, and/or exterior locations shall meet NEMA 4X requirements. All panels to be mounted in locations classified as hazardous shall meet both NEMA 4X and NEMA 7 requirements.
- f. Each panel enclosure shall be provided with one (1) equipment grounding lug bus bonded to the backpanel, enclosure, and door.
- g. When panels contain power wiring (voltage greater than 120 Vac), the main power disconnect shall be interlocked to prevent the panel door from being opened without first opening the main disconnect, except where approved by the Engineer. The interlock shall be equipped with a screwdriver operable defeater. The internal layout of the panel shall separate power and control components.
- h. All conduit entrances into panels shall be made with threaded gasketed hubs. The use of lock nuts is not acceptable. The Contractor shall coordinate the location of conduit entrances with his suppliers in order to provide sufficient room for wire bending and allow for access to internal components.
- i. Conduit entrances to all panels and devices shall be sealed, after wire installation, to prevent condensation/moisture from entering the panel or device. Conduit entrances into panels and devices shall not be made from the top unless specifically approved by the equipment manufacturer and Engineer.
- j. All pneumatic tubing or other piping entrances into control panels shall be made with bulkhead fittings.

- k. Freestanding panels shall be mounted on a concrete housekeeping pad and shall be bolted to the pad with a minimum of four-1/2-inch diameter stainless steel anchor bolts.
- 1. The interior of the control panels shall be equipped with a duplex maintenance receptacle and a switch controlled, full-length fluorescent lighting fixture where specified or shown on the drawings.
- m. Enclosure dimensions shall be as shown on the Drawings and/or approved by the Engineer.
- n. Intrinsic Barrier: Shall be IEC compliant, and have 8 circuit types. Universal AC power 100-240 VAC or 24 VDC. DIN rail or direct mounting. Provide IDEC model E33C or equal.
- o. All instruments and devices shall be mounted in the functional groups at an elevation between 30 and 72 inches above the floor. Layout shall be subject to the approval of the Engineer.
- p. Instruments and devices on panel faces shall be selected to match each other and to present a pleasing coordinated view.
- q. Permanent nameplates shall be supplied for all enclosure and all panel or remote (field) mounted meters, gages, control switches, indicating lights, relays, regulators, controllers, alarm switches, or other devices.
- r. Nameplates shall be attached to each item or to the panel face above the item, or lamp lens, with stainless steel screws except that an instrument may be identified on its face or case if specifically approved by the Engineer.
- s. Nameplates shall be engraved phenolic type. Nameplates to identify equipment designations or names shall be black background with white lettering. Nameplates to identify operator interface functions or operations shall be white background with black lettering. Nameplates to identify cautions or warnings shall be white letters on a red background. Lettering shall measure 0.5 inches high or as otherwise approved by the Engineer. Nameplates shall be attached with stainless steel sheet metal screws.
- t. Exterior paint shall be manufacturer's standard baked enamel finish; color shall be ANSI 49 medium light gray or as selected during shop drawing review. Finish shall be left in perfect condition following installation and acceptance. Two (2) one-pint containers of matching touch-up paint shall be furnished. Interior surfaces shall be painted white.

2.06 <u>INTERNAL WIRING</u>

- a. Control wiring shall be via type SIS stranded copper conductors of not less than 18 AWG conductors. All terminal points shall be made with insulated, crimp type, tubular tongues. All wire terminations shall be identified by tubular sleeve type markers.
- b. Instrumentation and electronic transmission (4-20 mA) cable shall be stranded, shielded, twisted pairs with not less than 18 AWG conductor wire and 18 AWG drain line. The wire shall have a minimum lay of 2" per twist. All termination points shall have terminal lugs. All wire terminations shall be identified by tubular sleeve type markers. Shielded cable shall have the shield grounded at one point for each loop only, preferably at the point of origin. Signal wires shall not be run in troughs carrying wiring used for any other purpose.

- c. Terminal blocks shall be used for all control and instrumentation interconnections. Each terminal shall be clearly numbered in a manner that permits reading of terminal designation without interference from terminated wires. Field terminals carrying 120 VAC shall be fused and equipped with a rocker-type fused switches with LED indicator to isolate the panel from 120 VAC for servicing.
- d. Each panel shall be provided with an adequate quantity of terminal points plus at least 20% spares.
- e. All signal and control wire runs shall be continuous from point to point. Where signal or control wire must be joined, only terminal strips shall be used. The signals between panels shall be 4-20 ma DC. The use of resistance or voltage signals shall be limited to connections fully within a single panel.
- f. Separate internal circuits shall be controlled by individual fused switches with LED indicator lights. Separate circuits shall be provided for each instrument loop, each control group, the annunciator, interior receptacles, lights, clock and miscellaneous items.
- g. Each circuit providing power to instruments or devices shall have its own neutral wire run from the instrument or device back to the neutral bus in that source. The use of a common neutral wire on different circuits or common return on control circuits is prohibited.
- h. An isolated grounding bus shall be installed along the bottom of each panel containing microprocessor based controllers, instrumentation equipment or electronic devices. The bus shall be equal to the length of the panel less 1'. It shall be constructed of 1/4" x 1" copper. It shall be installed such that it is insulated from the cabinet. The bar shall be furnished complete, drilled and tapped, with 10-32 binding head screws, which shall be utilized for connection of instruments. A lug (No. 6 through 2/0) shall be provided for connection of the bus to the isolated plant ground.
- i. Panel and remote mounted instrument and microprocessor grounds shall be bonded only to the panel isolated ground bus. The panel isolated ground bus shall be bonded only to the separately derived source, solidly grounded, neutral conductor. This neutral conductor shall be bonded directly to the building main grounding point via an insulated equipment grounding conductor, without any other connection. The separately derived source enclosure shall be isolated from the panel enclosure and raceway grounds in accordance with NFPA 70, NEC Articles 250-74 exception 4 and 250-75 exception.
- j. All internal wiring and piping shall be horizontal or vertical runs and groups of wires to common points shall be neatly harnessed and adequately supported. Wiring shall be run to one side of numbered terminal blocks mounted on the inside of the enclosure for connections to power and external equipment. An adequately sized wiring trough shall be provided on the other side of the terminal strip for the routing of field wiring. The layout of the panel shall ensure the separation of internal and external wiring. Signal wires shall not be run in troughs carrying power or control wires.

2.07 PANEL MOUNTED COMPONENTS - GENERAL

- a. Lighted Switches
 - 1. All multiple function indicator and operator-indicator devices mounted on the panels shall be oil tight, modular, square shape, uniform size and shall be "Coordinated Manual Controls" (CMC) as manufactured by Microswitch Division of Honeywell or equal. They shall be complete with cover plates, custom legend plates, and color inserts and contact blocks. Indicating assemblies

shall be transformer type with 1 watt, 6 vac, No. 755 lamps and shall be lit for the selected function. One lamp test push-button with necessary relays shall be provided for all lamps.

- b. Switches
 - 1. All single function switches and control devices on the local control panels shall be of NEMA 4X, oil/water tight construction, Square D Class 9001, Type SK, G.E. Series CR104P, or equal and provided with adequate legend plates.
- c. Motor-Starting Switches
 - 1. "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is on or off.
- d. Fractional Horsepower Manual Controllers
 - 1. "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is on, off, or tripped.
 - 2. Manufacturer: Eaton Type B100 or equal.
 - 3. Configuration: Nonreversing.
 - 4. Overload relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heater matched to nameplate full-load current of actual protected motor; external reset push button; bimettalic type.
 - 5. Overload relays: NEMA ICSS 2, bimetallic class as schedule on Drawings.
 - 6. Pilot light: Red
- e. Integral Horsepower Manual Controllers
 - 1. "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is on, off, or tripped.
- f. Hand Off Auto
 - 7. Selector switch, three position
 - 8. N.O. contacts, slow break, 1,000,000 cycles, silver alloy contacts, 10A, 600 volt, EN/IEC 60947-1 similar to Schneider type XB4BD33 or Equal.
- g. Push Button Station
 - 1. Two position switch, momentary action, spring return, silver alloy contacts, INC contact, 1,000,000 cycles, slow break 10A, 600 volt, EN/IEC 60947-1 similar to Schneider, type 9001KR16H5, or Equal.
- h. Indicating Lights
 - 1. Indicating lights for status, running, malfunction, alarm and other functions on local control panels, shall be of NEMA 4X oil/water tight construction. Lights shall be Square D Class 9001, Type SK, G.E. Watertight Series No. CR104P or equal. Lights shall be transformer type and with 1 watt, 6 VAC, No. 755 lamps. Lamps shall be press to test or one lamp test push-button with necessary relays shall be provided for all lamps.

i. Terminal Blocks

- 1. Terminal blocks for connecting panel wiring with field wiring shall be mounted on DIN rails. The terminal blocks shall be model no. NFT3 manufactured by Connectron, Entrelec, Square D, or equal.
- 2. Terminal blocks shall be one-piece molded plastic blocks with screw type terminals and barriers rated for 300 volts.
- 3. Terminals shall be double sided and supplied with removable covers to prevent accidental contact with live circuits.
- 4. Terminals shall have permanent, legible identification, clearly visible with the protective cover removed.
- 5. Terminal blocks shall be fused type where indicated on the drawings.
- 6. Analog signals shall be terminated on modular narrow form factor terminal blocks intended for the protection of a floating double conductor (4-20 mA analog) signal.
 - a. Two-stage surge protection for one operated floating double conductor.
 - b. Disconnect knife on both signal paths.
 - c. Separate ground connection.
 - d. Screw terminal connections.
 - e. Nominal voltage: 24 V DC
 - f. Phoenix Contact TERMITRAB TT-2-PE-M-24DC or equal.
- j. Fused Switches
 - 1. Fused switches for isolating outputs to remote locations and for internal panel isolation and protection of circuitry shall be model no. 1492-H4 as manufactured by Allen-Bradley, Entrelec, Square D, or equal with blown fuse indicator.
- k. General Purpose Relays
 - 1. All relays shall be UL labeled, general purpose, industrial grade, with plug-in base, sealed clear polycarbonate cover and neon lamp to indicate that the coil is energized.
 - 2. Relay-Specifications:

Contact:

Rating	10 Amp Resistive, DPDT
HP	1/4 HP at 120 VAC
Material	Gold Flashed Silver Button Mech.
Mech Life	50 million operations (AC)
Elec. Life	100,000 operations min. at rated resistive load
Max. Cycling Speed	10 operations per minute

Coil:

Nominal Voltage	12, 24 vDC or 120 VAC
Nominal Power	1.4 Volt-Amperes Max.
Power	2.55 Volt-Amperes

Temperature Rise	55° at nominal voltage
Duty	Continuous

General:

Operating Time	20 milliseconds Release
Time	15 milliseconds
Insulation Resistance	1,000 megohms at 500 VDC
Dielectric Strength	1,000 VACS, RMS (50/60 HZ)
Range	-45°C to 50°
Shock	20 G's, 11 + 1 ms, ¹ / ₂ sine wave
Vibration	6 G's, 10 to 55 HZ
Weight	Approx. 1- ¹ / ₂ oz.
Size	1.374" x 1.070" x .815" (hxwxd)

- 3. All relays shall be mounted with plug-in socket and retention clamp. No soldering is permitted. Relays with 120 VAC coils shall be series KRPA-N with round pin bases as manufactured by Potter and Brumfield or equal. Relays with other coil voltages shall be series KUMP-5 with straight blade bases as manufactured by Potter and Brumfield or equal.
- 1. Alternating Relay
 - 1. Alternating Relay shall be UL listed, capable of alternating two motors, can be used with two or three control switches.
 - 2. Relay shall have two Leu's to indicate which load will energize first.
 - 3. Control:

Voltage – 12, 24, 120, 240 volts Power – 3 VA Frequency – 50/60 HZ

Contacts:

Rating – 10amps @ 240 VAC / 30 VDC Mech Life – 10,000,000 operation Full Load – 100,000 operation

General:

Voltage Tolerance -10% / -15% of control voltage Temperature -28° to 65°C Transient Protection – 10,000 volts for 20 microseconds

- 4. Manufacturer:
 - a. Macromatic ARP Series
 - b. Or Equal

- 5. Control transformers shall be suitable for mounting internal to the panel and shall be style SBE-3PB as manufactured by Hevi-Duty or equal.
- m. Control Power Transformer
 - 1. Control power transformers for non-sensitive equipment such as electromagnetic devices, panel lights, panel receptacles, pneumatic system compressors, solenoid valve, and the like shall be continuous duty, dry type, epoxy encapsulated, industrial control transformers.
 - 2. Control transformers shall be UL listed, File E79947 and CSA certified File 7357.
 - 3. Control transformers shall be of a voltage and capacity corresponding to the supply characteristics and to the connected loads. Each transformer shall be provided with primary and secondary fusing for overload protection.
 - 4. Control transformers shall be suitable for mounting internal to the panel and shall be style SBE-3PB as manufactured by Hevi-Duty or equal.

PART 3 EXECUTION

3.01 VALIDATING, TESTING AND TUNING

- a. The Contractor shall furnish the services of a qualified control panel manufacturer's technician to start-up, shakedown and calibrate each control panel. This technician shall be scheduled for these services on the same days as the representatives of the process equipment when necessary.
- b. The Contractor shall notify the Engineer stating the installation is ready for testing ten (10) days prior to running of field test. All field-testing shall be performed in the presence of the Engineer or his representative.
- c. The technician shall record all final calibration setpoints, field testing data, and operational information. A complete, type written report shall be submitted to the Engineer for review.

3.02 SPARE PARTS

- a. The Contractor shall provide all spare parts recommended by the manufacturer as normal owner stock items. Each spare part shall be new and packaged in individual boxes. Each box shall be identified with a part number and description. As a minimum, the spare parts shall include:
 - 1. Printed circuit board assemblies (one of each type incl. CPU)
 - 2. Relays 10% (minimum 1) of each type, range, ampacity
 - 3. Fuses 10% (minimum 1) of each type, range, ampacity
 - 4. Lights 10% (minimum 1 sleeve) of each type, range and ampacity
 - 5. Capacitors, Diodes, Resistors

3.03 OPERATIONS AND MAINTENANCE MANUALS

A. The Contractor shall provide six (6) copies of an Operations and Maintenance Manual (O&M Manual) for each control panel specified herein. Each manual shall include full size as-built drawings

corrected to conform to post-commissioning panel modifications and complete instructions covering the installation, operation, maintenance and troubleshooting of that equipment control panel including the panel mounted and field mounted devices.

3.04 PANEL RECORD DRAWINGS

a. Approved wiring diagrams and schematics encased in plastic shall be provided for all panels. The diagrams shall represent the "as-built" circuitry including field modifications during start-up and shall show connections from numbered terminal blocks to external equipment. Color coding and terminal numbers shall be indicated. At the Contractor's option, these drawings may be photographically reduced to facilitate placement and encasement; however, size shall be as approved by the Engineer to provide ease of legibility. The encased drawings shall be placed in the panel's drawing pocket.

3.05 MAINTENANCE CONTRACT

a. The Contractor shall provide a one (1) year maintenance contract covering calibration and operation of the equipment including parts and labor. All costs associated with the maintenance contract shall be included in the lump sum bid for this work. The maintenance contract shall initiate after completion of start-up and the Engineer announces provisional acceptance. The maintenance contract shall include service calls at intervals of 60 days to check the calibration and operation of the equipment to the satisfaction of the Owner. The maintenance contract shall be administered by a manufacturer's authorized dealer.

3.06 OPERATOR TRAINING

- a. The Contractor shall provide a minimum of two (2), six (6) hour instruction and training period by the Control System Coordinator on the operation, maintenance and troubleshooting of each control panel.
- b. The training shall occur after submittal and approval of the O&M Manuals and after acceptance by the Engineer of all start-up, shakedown, calibration, and commissioning procedures.

END OF SECTION

SECTION 16440 PANELBOARDS

PART 1 - GENERAL

1.1 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Distribution panelboards.

1.2 <u>DEFINITIONS</u>

- a. SVR: Suppressed voltage rating.
- b. SPD: Surge Protection Device

1.3 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- b. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- a. Qualification Data: For qualified testing agency.
- b. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

c. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing indicating the connected load for each breaker in accordance with the NEC. Schedule to be typed and dated.

1.5 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals, including the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 <u>MAINTENANCE MATERIAL SUBMITTALS</u>

- a. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Two spares for each type of panelboard cabinet lock.
 - 2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Provide spare breakers as shown in the schedules on the drawings

1.7 **QUALITY ASSURANCE**

- a. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- b. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- c. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. Comply with NEMA PB 1.
- e. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- a. Store in accordance with the manufacturer's recommendations.
- b. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 **PROJECT CONDITIONS**

a. Environmental Limitations: 507408636-002 February 2020

- 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).
- b. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet (2000 m).

1.10 <u>COORDINATION</u>

- a. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- b. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 <u>WARRANTY</u>

- a. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 <u>GENERAL REQUIREMENTS FOR PANELBOARDS</u>

- a. Enclosures: See Plan Sheet Panel Schedule for Enclosure Types and Mounting.
 - 1. Provide rated enclosures as shown below unless otherwise indicated on plans:
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Indoor Damp or Wet Locations: NEMA 250, Type 4X.

- c. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
- d. For conditions not addressed above, provide rated enclosures for environmental conditions at installed locations.
- 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- 3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- 4. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel unless indicated otherwise on panel schedule.
- 5. Directory Card: Inside panelboard door, mounted in transparent card holder. All breaker text to be typed and dated. Directory card shall include the source of supply to the panelboard. Directory card shall include typed contact information for the electrical Contractor
- b. Incoming Mains Location: Top or bottom per Contractors installation method unless specifically indicated on the drawings.
- c. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 3. Neutral Bus: 100% of the phase bus capacity unless otherwise indicated.
- d. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral LugsMechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- e. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- f. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- g. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 <u>PERFORMANCE REQUIREMENTS</u>

a. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2. Provide SPD devices per section 16280 of the project documents.

2.3 DISTRIBUTION PANELBOARDS

- a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
 - 5. Or Equal.
- b. Panelboards: NEMA PB 1, power and feeder distribution type.
- c. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- d. Mains: As shown on the drawings
- e. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolton circuit breakers.
- f. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolton circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- g. Branch Overcurrent Protective Devices: Fused switches.

2.4 <u>DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES</u>

- a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
 - 5. Or Equal.
- b. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

- 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 200 A and larger.
- 2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I squared x t response.
- 3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted or Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
 - f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off] position.
 - g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 <u>ACCESSORY COMPONENTS AND FEATURES</u> (if called for on the Drawings)

a. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 <u>EXAMINATION</u>

- a. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- b. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- c. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- d. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- a. Install panelboards and accessories according to NEMA PB 1.1.
- b. Equipment Mounting:
 - 1. Wall/Rack Mounted:
 - a. Mount to wall/rack using unistrut with bolts/mounting hardware approved by the structural Engineer or Architect.
- c. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- d. Mount panelboards such that the highest operator is less than 78" above finished floor.
- e. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- f. Install overcurrent protective devices and controllers not already factory installed.
 - 2. Set field-adjustable, circuit-breaker trip ranges.
- g. Install filler plates in unused spaces.
- h. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- i. Comply with NECA 1.

3.3 <u>IDENTIFICATION</u>

- a. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 16075 "Identification for Electrical Systems."
- b. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- c. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 16075 "Identification for Electrical Systems."
- d. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 16075 "Identification for Electrical Systems."

3.4 <u>FIELD QUALITY CONTROL</u>

- a. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- b. Perform tests and inspections.

- 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- c. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- d. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- e. Panelboards will be considered defective if they do not pass tests and inspections.
- f. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 <u>ADJUSTING</u>

- a. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- b. Set field-adjustable circuit-breaker trip ranges as specified in the "Overcurrent Protective Device Coordination Study."
- c. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

- 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
- 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 <u>PROTECTION</u>

a. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION*

<u>SECTION 16510</u> INTERIOR LIGHTING

PART 1 - GENERAL

1.1 <u>SUMMARY</u>

- a. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Lighting fixture supports.
- b. Related Sections:
 - 1. Division 16

1.2 <u>DEFINITIONS</u>

- a. BF: Ballast factor.
- b. CCT: Correlated color temperature.
- c. CRI: Color-rendering index.
- d. HID: High-intensity discharge.
- e. LER: Luminaire efficacy rating.
- f. Lumen: Measured output of lamp and luminaire, or both.
- g. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.3 <u>ACTION SUBMITTALS</u>

- a. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Ballast, including BF.
 - 3. Energy-efficiency data.
 - 4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
 - 5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
 - a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- b. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- c. Samples: When requested by the Engineer, provide a sample light fixture of each type and style including all specified options, mounting brackets, and accessories. Each Sample shall include the following:
 - 1. Lamps and ballasts, installed.
 - 2. Cords and plugs.
 - 3. Pendant support system.
- d. Installation instructions.

1.4 INFORMATIONAL SUBMITTALS

- a. Coordination Drawings:
 - 1. Lighting fixtures.
- b. Warranty: Sample of special warranty.

1.5 <u>CLOSEOUT SUBMITTALS</u>

- a. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 **QUALITY ASSURANCE**

- a. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- c. Comply with NFPA 70.

1.7 <u>COORDINATION</u>

a. Coordinate layout and installation of lighting fixtures with other equipment.

1.8 <u>WARRANTY</u>

- a. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year.

PART 2 - PRODUCTS

2.1 <u>MANUFACTURERS</u>

a. Products: Subject to compliance with requirements, provide product indicated on Drawings or equal per the General Provisions of the Contract.

2.2 <u>GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS</u>

- a. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- b. Metal Parts: Free of burrs and sharp corners and edges.
- c. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- d. All light fixtures shall be circuited to the nearest power panel unless otherwise indicated on the drawings. Conductors shall be 3#12 in a ³/₄"c.
- e. All fixtures shall be provided with lamps.
- f. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125-inch (3.175 mm) minimum unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- g. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp and ballast characteristics:

- a. "USE ONLY" and include specific lamp type.
- b. Lamp diameter code (T-4, T-5, T-8, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
- c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
- d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
- e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- f. CCT and CRI for all luminaires.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- a. General Requirements for Electronic Ballasts:
 - 1. Comply with UL 935 and with ANSI C82.11.
 - 2. Designed for type and quantity of lamps served.
 - 3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
 - 4. Sound Rating: Class A Total Harmonic Distortion Rating: Less than 10 percent.
 - 5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 - 6. Lamp Current Crest Factor: 1.7 or less.
 - 7. BF: 0.88or higher.
 - 8. Power Factor: 0.95 or higher.
- b. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
 - 1. Ballast Manufacturer Certification: Indicated by label.
- c. Ballasts for Low-Temperature Environments:
 - 1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
- d. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

2.4 <u>LED LAMPS</u>

a. Color temp and CRI to match adjacent spaces.

2.5 <u>LIGHTING FIXTURE SUPPORT COMPONENTS</u>

a. Comply with Section 16070 "Hangers and Supports for Electrical Systems" for channel- and angleiron supports, and nonmetallic channel and angle supports.

- b. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- c. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- d. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- a. Lighting fixtures:
 - 1. Set level, plumb, and square unless otherwise indicated.
 - 2. Install lamps in each luminaire.
- b. Connect wiring according to Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

3.2 <u>IDENTIFICATION</u>

a. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 16075 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

a. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 16740 PROCESS INSTRUMENTATION

PART 1 - GENERAL

1.01 <u>SCOPE</u>

- a. Description of Work
 - 1. Provide all labor, material and necessary equipment to install instrumentation and control systems and be responsible for the satisfactory operation of the entire system as specified herein and as shown on the drawings.
 - 2. Work includes supplying erecting, testing and placing in operation the system specified.
 - 3. Work includes the supply and installation of all process measuring elements, transmitters interconnecting wiring and process taps as specified herein and indicated on the drawings.
 - 4. Work includes the provision and connection of all wiring to and from every electrical device furnished under this Section including 120-volt power wiring and all instrumentation and control wiring.
 - a. All wiring shall be in accordance with Section 16050, Basic Electrical Requirements, with exceptions as required herein.
 - b. Instrumentation and Control Wiring noted within this Specification Section includes:
 - 1) Circuits used to carry analog signals
 - 2) Circuits used to start and stop equipment
 - 3) Circuits used to key a control function or serve as an interlock
 - 4) Circuits used to indicate equipment operating status
 - 5) Circuits used to actuate alarms.
 - c. Work includes the provision and installation of and all piping, manual shut-off valves, and mounting hardware (e.g. nuts, bolts, washers, pipe stands, or cinch anchors) associated with connecting or mounting the instrumentation, as described herein.
- b. Related Work Specified Elsewhere
 - 1. The provisions of this Section are a direct extension of Section 16050, Basic Electrical Requirements, and although set forth only once within the Specification, shall apply equally to this Section.

1.02 <u>PERFORMANCE</u>

- a. Contractor
 - 1. The Contractor shall be responsible for the complete supply and installation of process instrumentation and control systems furnished by a single company regularly engaged in the manufacture of process instrumentation systems.

- 2. Functional system data is described herein and is augmented by accompanying product specifications. All elements shall be provided as shown and/or required. Additional elements such as power supplies, current repeaters, and other such elements as may be required to complete the system shall be provided even though not shown.
- 3. All material shall be new, free from defects, and of the quality specified or shown. Each type of material shall be of the same manufacturer throughout the work. All material shall be the product of established, reputable manufacturers normally engaged in the production of the particular item being furnished.
- b. Instrumentation Supplier
 - 1. All instrumentation equipment, panels, sensors, transmitters and other system components shall be supplied by one instrumentation manufacturer who shall be responsible for total system design, integration and functioning of the system and all components, including those items manufactured by others but furnished by the instrumentation supplier.
 - 2. The instrumentation supplier must have the proven skill, experience, ability, facilities, and qualified personnel necessary to successfully, timely and properly complete the involved work. During the bid evaluation period, any proposed instrumentation supplier will be evaluated to consider their ability to satisfy the foregoing requirements.
 - 3. The instrumentation supplier must assign sufficient qualified personnel to the project to assure the timely and proper completion of the work. Full, continuous, and detailed supervision of the work will be required.
- c. Equipment Requirements
 - 1. The product Specifications include description of instrumentation items used in systems. In certain instances, this description is followed by at least one (1) brand name (and/or model number) and an "or equal" provision. Each product submitted under the "or equal" provision will be reviewed as to whether it is acceptable as an equal.
 - 2. In conducting such a review, the Owner shall consider the comparability of the specifically named products with the "or equal" products, including specifically their relative performances. Such review shall be based both on the product individually and its interrelationship with all other aspects of the instrumentation system.

1.03 <u>SUBMITTALS</u>

- a. Operating instructions, manuals and shop drawings shall be submitted in accordance with Section 01330, Submittal Procedures.
- b. Instrument supplier shall review the Contract drawings to verify suitability of the supplied instrument for the intended application prior to submittal process.
 - 1. Provide verification of this review process by instrument and application.
- c. Shop drawings shall include the following:
 - 1. Catalog Cut sheets.
 - 2. Field wiring diagrams.

- 3. Construction drawings and engineering data defining materials of construction, dimensions, weights and sizes.
- d. Operation and Maintenance Manual:
 - 1. Submit complete bound manuals for all hardware and software components assembled into 3 ring binders.
 - 2. Include:
 - a. Shop Drawing information
 - b. Calibration information
 - c. Configuration of each device, as configured at time of Maintenance Training.
 - d. Disk copies of all custom programs incorporated.

1.04 EQUIPMENT MANUFACTURER'S SERVICE REPRESENTATIVE

- a. Installation Assistance
 - 1. Provide the services of a qualified factory engineer to supervise the installation, to test and make any adjustments required, and to place the completed system in operation.
- b. System Operation Training
 - 1. The Contractor shall have the instrumentation supplier provide a factory trained engineer to instruct the Owner's operating personnel in the use, operation, care, and maintenance of the process control instrumentation.
 - 2. The training shall be conducted on-site and be presented in a manner to impart thorough understanding of the systems and equipment provided.

1.05 **PRODUCT IDENTIFICATION**

a. All the equipment shall have a stainless-steel name plate permanently affixed in a conspicuous place on which is plainly marked the manufacturer's name, address, model number, and loop number as stated in the Specifications and shown on the Drawings. The nameplate of a distributing agent only is not acceptable.

1.06 <u>TESTING</u>

- a. Factory Tests
 - 1. Testing of Individual Components
 - a. Each item of equipment shall be fully factory inspected and tested for function, operation and continuity of circuits.
 - b. Each instrument shall be factory calibrated. Calibration sheets verifying instrument accuracy shall be supplied.

- 2. Full System Tests
 - a. An operation check of the entire system shall be performed by the instrumentation supplier at his factory. Power and manually adjustable measurement and control circuits shall be connected to the central control for simulating the functions specified within the Specification section.
 - b. The Town shall be notified at least ten (10) days in advance of any factory systems tests and reserves the right to have its representatives in attendance.
- b. Field Tests
 - 1. An operation check of the entire system shall be performed by the instrumentation supplier after installation to verify operation.
 - 2. Power and manually adjustable measurement and control circuits shall be connected to the control system to verify the functions specified within the Specification section.

1.07 <u>WARRANTY</u>

- a. Warranty shall be in accordance with the General Conditions.
- b. The equipment shall be unconditionally guaranteed to meet or exceed the design criteria detailed in Part 2 of this Specification.

PART 2 - PRODUCTS

2.01 <u>LEVEL INSTRUMENTS</u>

- a. Level Transmitter
 - 1. Operating Principle:
 - a. Ultrasonic level sensing
 - 2. Environment
 - a. Rated for use in Class I, Groups B, C, D, Division 1.
 - b. Enclosure Rated NEMA 4X.
 - 3. Maximum Level
 - a. 10 meters
 - 4. Operating Temperature
 - a. Ambient: -40° C to 60° C
 - b. Process: -20° C to 60° C

- 5. Process Pressure
 - a. 2 bar up to $25^{\circ}C$
- 6. Housing material: stainless-steel
- 7. Seal Material: EPDM
- 8. Protection Rating 1P66/1P6S
- 9. Output 4-20 MA two
- 10. Warranty
 - a. 3 years
- 11. The Level Transmitter shall be Dwyer Mercoid ULT or Equal.

2.02 FLOW INSTRUMENTS

- a. Basis of design is Tigermag EP as by Sparling. Other manufactures offering products subject to compliance with requirements, are limited to, the following:
 - 1. Endress+Hauser
 - 2. Siemens
 - 3. Emerson/Rosemount
 - 4. Or Equal
- b. Magnetic Flow Meter
 - 1. Magnetic flow meters shall be rated for use in Class I Div. 1 Group B, C, D environments.
 - 2. Magnetic flow meter systems shall include a magnetic flow tube and a remote mounted microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube.
 - a. Magnetic flow meters shall utilize the characterized field principle of electromagnetic induction, and shall produce DC signals directly proportional to the liquid flow rate.
 - 3. Grounding rings shall be provided for all meters.
 - 4. All materials of construction for metallic wetted parts (electrodes, grounding rings, etc.) shall be 316 stainless steel minimum, but shall be compatible with the process fluid for each meter in accordance with the recommendations of the manufacturer.
 - 5. Flow tube shall be rated for pressures up to 1.1 times the flange rating of adjacent piping.
 - a. System shall be rated for ambient temperatures of -30 to +65C.
 - b. Non-metallic transmitter housings shall not be acceptable.
 - 6. Flow tube shall be rated for continuous submersion to 30':
 - 7. Standard Specifications
 - a. Accuracy:(Freq Out)
 - 1) 0.1" 0.25": 1% of flow (1- 33 fps)

- 2) 0.5" 72": 0.5% of flow (1-33 fps)
- 3) Optional 0.25% of flow (1 33 fps)
- b. Temp Effect: ±0.025% FS/°C
- c. Full Scale Ranges: From 0-3 ft to 0-33 ft/sec
- d. Repeatability: ±0.1% of full scale
- e. Electrodes: 316 stainless steel standard
- f. Liner: Ceramic (AlOx 99.5%) Hard Rubber, Neoprene, Polyurethane Food Grade Polyurethane, TEF (FEP/PTFE)
- g. Outputs
 - 1) Isolated analog 4-20mA DC into 800 ohms (std)
 - Scaled pulse 24 V DC with selectable 12.5/25/50/100 ms on time, max.freq. 60 Hz
 - 3) 0-1000 Hz freq., for 0-100% of flow rate, 15 V DC
 - 4) Two flow alarms
 - 5) Fault, with open collector
 - 6) RS232 communication
 - 7) Flow direction with open collector
 - 8) Positive Zero Return (PZR) for external relay contacts. Outputs 2 & 3 can be open collector if required.
- h. Mag-CommandTM: Selection and change of meter parameters by magnetic probe without opening the enclosure.
- i. Display: 2-Line, 16 Digit alphanumeric backlit display (rate and total). Modular, rotatable 360° in 90° increments
- j. Conductivity: Minimum 5 micromhos/cm
- k. Min Velocity: 0.3 fps (0.1 mps)
- 1. Power Requirements: 77-265 Vac 50/60 Hz (12-60 Vdc optional)
- m. Power Consumption: Less than 20 Watts
- n. Enclosures: Transmitter: Cast aluminum epoxy coated. Integral (NEMA-7) or remote mounted (NEMA-4X) Fabricated steel, epoxy coated.
- o. Preamp Impedance: 1012 ohms minimum
- p. Amb. Temp: -20° to 140°F (-30° to 60°C) Display darkens over 158°F (70°C)
- q. End Connections: 150 lb or 300 lb
- r. Sensor Tube: 304 Stainless Steel
- s. Process Temp:
 - 1) Integral Mount:
 - a) Hard Rubber, Neoprene, Polyurethane, Food
 - b) Grade Polyurethane -40- 180°F
 - c) TEF, Ceramic.....-40 212° F
 - 2) Remote Mount (opt):
 - a) TEF, Ceramic.....-40 266°F
 - 3) High Temp Coils (opt):
 - a) TEF.....-40 300°F
 - b) Ceramic.....-40 420°F
- t. Selectable Damping: 0-99 seconds
- u. Low Flow Cutoff: Selectable 0-9% of FS
- v. Options:
 - Remote Mounted NEMA-4X or NEMA-7 Enclosure
 - Sensor rating of NEMA6/IP67, NEMA6P/IP68 and Direct Burial

- Electrode Materials: Titanium, Hastelloy C, Monel, Zirconium, Tantalum, Platinum, Fused Platinum (ceramic only)
- Process Temperature to 420°F (216°C) (Ceramic Only)
- 12-60 Vdc operation
- HART, Modbus
- RS-485 Communication
- Alarm with 10A relays (NEMA-4X remote only)
- Process Pressure to 1750 psi

2.03 FLOAT INSTRUMENT

- a. Float Switch
 - 1. Environment: IP68
- b. Body Style: Float Polypropylene
- c. Mounting Type: Hanging
- d. Output: SPDT NO/NC
 - 1. 10A @ 250V AC
- e. Sensing Mode: Mechanical
- f. Temperature Limit: 32° to 122°F
- g. Termination: Casle
- h. Manufacturer: Dwyer Series CFS2 or Equal.

PART 3 - EXECUTION

3.01 <u>ERECTION</u>

- a. General
 - 1. Equipment shall be located so that it will be readily accessible for operation and maintenance.
 - 2. The Contractor shall examine the Contract Drawings and shop drawings for the various equipment in order to determine the best arrangement for the work as a whole, and shall use personnel skilled in the applicable trade for the erection of the various materials and interconnections.
- b. Equipment Mounting and Support
 - 1. Field instruments shall be mounted in the areas specified or otherwise noted.

- 2. Instruments attached directly to concrete shall be spaced out from the mounting surface not less than 1/2 inch by use of phenolic spacers or framing channel.
- 3. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces.
- c. Transmitters
 - 1. Flow shall be wall mounted in Pump station Control Panel.
- d. Magnetic Flowmeters
 - 1. Ground magnetic flow meter flow tubes and grounding rings in strict accordance with the manufacturer's recommendations.

3.02 <u>ELECTRICAL WORK</u>

- a. Signal wiring shall be carried in raceways or conduit provided in accordance with Division 16 of these Specifications.
 - 1. Shielded twisted pairs carrying 4-20 mADC and other low-level signals shall be run in conduits or raceways separate from all other control and power wiring.
 - a. All analog circuits shall be run as twisted pairs or triads.
 - b. In no case shall a circuit be made up using conductors from different pairs or triads.
 - c. Triads shall be used wherever three (3) wire circuits are required.
 - d. Triads shall not be formed by using two (2) pairs.
 - 2. Terminal blocks shall be provided at all instrument cable junctions, and all circuits shall be identified at such junctions.
 - 3. Signal circuits shall, in general, be run without splices between instruments, terminal boxes or panels.
- b. Shields shall, in general, be bonded to the ground bus at the control panel and isolated at all other locations.
 - 1. Terminal blocks shall be provided for interconnecting shield drain wires at all junction boxes.
- c. Alternating current power supply connections for panel mounted equipment shall be by cord and plug (where practicable).
 - 1. Field mounted units shall be wired in solid and provided with a power disconnect switch either internally or adjacent to the unit.
 - 2. Where multiple field mounted units are fed from a single circuit breaker, each field mounted unit shall be protected by individual draw-out fuses.

3.03 FIELD TESTING AND ACCEPTANCE

- a. Analog Instrument Calibration
 - 1. All analog instruments shall be installed such that taps and parts, etc. are available for inplace calibration and test without removal.
 - 2. Field calibration shall be achieved using a minimum of five (5) points (0, 25, 50, 75, and 100 percent) for calibration
- b. Operational Tests
 - 1. Inspection: Verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.
 - 2. Electrical Tests: Minimum required tests are as follows:
 - a. Verify the absence of unwanted voltages between circuit conductors and ground.
 - b. Test all conductors for short circuits using an insulation-testing device.
 - c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit.
 - 3. Pretesting:
 - a. After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents.
 - b. Correct deficiencies observed in pretesting.
 - c. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved.
 - d. Prepare forms for systematic recording of acceptance test results.
 - e. After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
 - 4. Operational Tests:
 - a. Schedule tests after pretesting has been successfully completed.
 - b. Test all modes of system operation at each device.
 - c. All conditions of operation shall be simulated to demonstrate that each system operates properly.
 - d. Test each initiating and indicating device for operation and proper response at local control stations, PLC panel and supervisory control station.
 - 5. Report of Tests and Inspections:
 - a. Prepare a written record of tests, inspections, and detailed test results in the form of a test log.
 - 6. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.
- c. Acceptance

- 1. The system will not be accepted until all equipment satisfies the acceptance test requirements. The complete system shall operate continuously during an acceptance test period of not less than thirty (30) days with no down-time of the complete system resulting from failure of hardware. Downtime of the system or portions of the system resulting from the following causes will not be considered system failures:
 - a. Downtime resulting from an outage of the main power supply provided that automatic shutdown and restart of the system satisfies the requirements of these Specifications.
 - b. Downtime of a portion of the system resulting from failure of a communications channel provided that the system operated as specified under this condition.
 - c. Downtime caused by operator error.

3.04 MAINTENANCE

a. Corrective maintenance shall be performed only by a factory trained service technician specifically trained for servicing the types of equipment furnished under this Contract.

END OF SECTION