



Town of Wilmington, Massachusetts

Department of Public Works, 121 Glen Road, Wilmington MA 01887

TECHNICAL SPECIFICATIONS

Volume 1 of 1

**Town of Wilmington, MA
Department of Public Works**

Pilcher Drive Pump Station Wastewater Grinder Installation

November 2019



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TOWN OF WILMINGTON, MASSACHUSETTS

**CONTRACT DOCUMENTS
FOR**

PILCHER DRIVE PUMP STATION WASTEWATER GRINDER INSTALLATION
(PROJECT)

November 2019

Town of Wilmington

Wilmington Town Hall

121 Glen Road

Wilmington, MA 01887

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TECHNICAL SPECIFICATIONS

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TOWN OF WILMINGTON, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

PILCHER DRIVE PUMP STATION WASTEWATER GRINDER INSTALLATION

INVITATION FOR BIDS

Sealed bids for the construction of the **Pilcher Drive Pump Station Wastewater Grinder Installation** will be received at the Office of the Town Manager, Wilmington Town Hall, 121 Glen Road, Wilmington, MA 01887 until 10:00 AM local time on December 11, 2019, at which time they will be publicly opened and read aloud. Each Bid must be accompanied by a bid security consisting of a BID BOND, CASH, or, CERTIFIED CHECK issued by a responsible bank or trust company in the amount of 5% of the bid price.

Work to be performed under this Contract includes, but is not limited to, providing all materials, equipment, labor and supervision to: remove and replace approximately 60 linear feet of 15-inch gravity sewer; install cured-in-place spot repair (CIPSR); furnish and install a new sewer manhole with an access hatch, new channel grinder, a rail system to raise and lower said channel grinder, new grinder control panel, buried electrical conduit and wiring, new fencing, new access gate, new trees/shrubs, and all associated site work and appurtenances.

Beginning November 20, 2019, Bidding Documents in electronic form may be obtained online at www.wilmingtonma.gov. Neither the Owner nor the Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from another source.

A performance bond in an amount equal to 100 percent of the total amount of the contract price with a surety company qualified to do business in the Commonwealth of Massachusetts will be required for the faithful performance of the contract, as well as a labor and materials bond in an amount equal to 100 percent of the total contract price.

All bids for this project are subject to applicable public bidding laws of Massachusetts, including, but not limited to G.L. c.30, §39M.

Attention is directed to the minimum wage rates to be paid as determined by the Commissioner of Labor and Workforce Development and the weekly payroll record submittal requirements under the provisions of Massachusetts General Laws.

Selection of the contractor will be based upon bidder qualifications, including evidence of past performance in similar projects, and bid price. The contract will be awarded to the bidder deemed by the awarding authority to be the lowest responsible and eligible bidder.

The bidder agrees that its bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of the bids.

The Town reserves the right to waive any informalities, to accept or reject, in whole or in part any or all bids, or take whatever other action may be deemed to be in the best interest of the Town.

The Town of Wilmington, MA

By: Jeffery M. Hull, Town Manager

+ + END OF SECTION + +

SECTION 00100

INSTRUCTIONS TO BIDDERS

1. Receipt and Opening of Bids

The Town of Wilmington, Massachusetts, herein called the Owner, acting by and through its Town Manager, will receive sealed Bids for the project known as the **Pilcher Drive Pump Station Wastewater Grinder Installation**.

General bids addressed to the Town Manager's Office, Wilmington Town Hall, 121 Glen Road, Wilmington, MA 01887 and endorsed "*Bid for Pilcher Drive Pump Station Wastewater Grinder Installation*" (Project) will be received at the Office of the Town Manager until 10:00 AM prevailing time, on Wednesday, December 11, 2019 at which time and place said bids will be publicly opened and read aloud.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. The bidder agrees that its bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids.

2. Location and Work to be Done

The Work to be done under this contract consists of providing all materials, equipment, labor and supervision to: remove and replace approximately 60 linear feet of 15-inch gravity sewer; install cured-in-place spot repair (CIPSR); furnish and install a new sewer manhole with an access hatch, new channel grinder, a rail system to raise and lower said channel grinder, new grinder control panel, buried electrical conduit and wiring, and all associated appurtenances.

The location, general characteristics, and principal details of the Work are indicated on the plans entitles: Town of Wilmington, MA, "PILCHER DRIVE PUMP STATION WASTEWATER GRINDER INSTALLATION".

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum from time to time during the bidding period by the Owner or its Engineer, and shall then become a part of the Contract Documents.

The Contractor shall furnish all labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

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

All bidders shall visit the site and examine all contract documents before submitting bids, and inspect and be thoroughly familiar with them and conditions under which work will be carried out.

The Awarding Authority will not be responsible for errors, omissions and/or changes for extra work arising from General or Subcontractor's failure to familiarize themselves with contract documents or existing conditions. By submitting a bid, the bidder agrees and warrant that he/she is has examined the site and the contract documents, and that he/she is familiar with the conditions and requirements of both and where they require, in any part of the work given result to be produced, that the contract documents are adequate and that he/she will produce the required results.

3. Preparation of Bid

Each bid must be submitted on the prescribed form. All blank spaces for bid prices must filled in, in ink or typewritten, in both words and figures.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

4. Bid Opening Procedure

The following list of requirements shall apply to each filed bid. Bids not meeting all the requirements for timeliness and security will be rejected; bids not meeting signature and addenda requirements will be rejected prior to checking of bid amounts.

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

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

Bid signatures will be checked.

All addenda will be sent certified mail, with return receipt requested, and/or facsimile or e-mail to all prospective bidders. All bidders shall include with their bids the written acknowledgment form provided in Section 00300, FORM OF GENERAL BID.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may examine all bids after the bid opening and after the reading of the three apparent low bids.

5. Modification

Any bidder may modify his bid by written communication to the Owner at any time prior to the scheduled closing time for receipt of bids and that the individual making the request is a representative of the Firm having signature privileges from the firm submitted a bid.

The communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened.

6. Ability and Experience of Bidder

No award will be made to any bidder who cannot satisfy the Owner that he has sufficient ability and experience in this class of work and sufficient capital and plant to enable him to prosecute and complete the work successfully within the time named. The Owner's decision or judgment on these matters will be final, conclusive, and binding.

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

7. Conditions of Work

Each bidder must familiarize himself fully with the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

8. Addenda and Interpretations

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

Every request for such interpretation should be in writing addressed to Sean Mitchell, Arcadis, 500 Edgewater Drive, Suite 511, Wakefield MA 01880 or to email address: (sean.mitchell@arcadis.com) to be given consideration must be received ***at least seven (7) days*** prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which will be issued by email to all prospective bidders. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

9. Security for Faithful Performance

Simultaneously with his delivery of the executed Contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor and materials under this contract. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Owner. The bonds shall remain in force for one year after final acceptance of the work by the Owner, unless the Owner, in writing, releases the Contractor from the obligation sooner. If there is more than one (1) Surety Company, the surety companies shall be jointly and severally liable.

10. Power of Attorney

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

11. Laws and Regulations

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the Contract the same as though written out in full.

12. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 10 days after presentation thereof by the Owner, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his/her bid, but the amount forfeited shall not exceed the difference between his/her bid price and the bid price of the next lowest responsible and eligible bidder. In case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, his/her bid deposit will be returned.

The Town has established a liquidated damage, outlined in Section 00500, Agreement.

13. Obligation of Bidder

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

14. Information Not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the

information and convenience of bidders and is not guaranteed.

It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents. It is further agreed and understood that no bidder or Contractor shall use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner or the Architect/Engineer, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

15. Bid Security

Each bid and sub-bid must be accompanied by bid security in the form of a certified check, a bid bond, cash, or a treasurer's or cashier's check, payable to the Owner, in the amount of five (5) percent of the value of the bid. Such security of general bidders will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining securities will be returned promptly after the Owner and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to the selected contractor within 30 days, Saturdays, Sundays and holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

16. Right to Reject Bid

The Owner reserves the right to waive any informalities in bids and to reject any and all bids, should the Owner deem it to be in the public interest to do so.

The Owner may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities.

17. Time for Completion

The successful general bidder must agree to commence work within ten (10) days of the date of the Notice to Proceed and to fully complete the project within the time limit stated in Section 00300, FORM OF GENERAL BID.

18. Comparison of Bids

Bids will be compared on the basis of prices set forth in the bid forms. Any unit price bid that contains a unit price, which is unduly high or low, may be rejected as unbalanced. In the event that there is a discrepancy between the lump sum or unit prices written in words and figures, the prices written in words will govern.

19. Award of Contract

Only Contractor's having at least five (5) years of experience in installing wastewater grinders will be considered as "responsive" and eligible for bidding. Contractors are required to provide evidence within the bid submittal of installing wastewater grinders over the last 5 years.

The Contract will be awarded to "the lowest responsible and eligible bidder" pursuant to General Laws Chapter 30, Section 39M, as amended. Such a bidder shall possess the skill, ability and integrity necessary for the faithful performance of the work, shall be able to furnish labor that can work in harmony with all other elements of labor employed, or to be employed, in the work, and shall otherwise comply with all applicable provisions of law. Contract award shall be subject to availability of an appropriation for funding.

20. Statutes Regulating Competitive Bidding

Any bid which does not comply with the provisions of Massachusetts General Laws Chapter 30, Section 39M, as amended, need not be accepted and the Owner may reject every such bid.

21. Wage Rates

Prevailing Wage Rates as determined by the Commissioner of Department of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27G, as amended, apply to this project. It is the responsibility of the bidder, before bid opening, to request any additional information on Prevailing Wage Rates for those tradespeople who may be employed for the proposed work under this contract.

The Town shall require copies of certified payroll to be submitted prior to the request for monthly application for payment (AIA G702 format).

22. Contractor Records

The Contractor shall comply with the provisions of Massachusetts General Laws, Chapter 30, Section 39R concerning Contractor records.

23. Insurance

The Contractor shall carry and continuously maintain until completion of the Contract, insurance as specified in Agreement and in such form as shall protect him performing work covered by this Contract, and the Town of Wilmington and its employees, agents and officials, from all claims an liability for damages for bodily injury, including accidental death, and for property damage, which may arise from operations under this Contract. The Town shall be named as an additional insured. The Contractor covenants and agrees to hold the Town and its employees, agents and officials harmless from loss or damage due to claims for bodily injury or death and/or property damage arising from, or in connection with, operations under this Contract. The Town shall require the Contractor to name the Town and Arcadis as an additional insured for this Project.

24. Health and Safety

Chapter 306 of the Acts 2004 – an Act Relative to the Health and Safety on Public Construction Projects. The below statement has been added to general contract bid forms.

The Contractor shall be responsible for furnishing 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 made subject to section 44A.

25. PROJECT MANAGER

The Owner may utilize the services of a project manager, whose duties shall be as set forth in an Agreement for Project Manager Services.

+ + END OF SECTION + +

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SECTION 00300

BID FORM

Bid of _____ (hereinafter called "Bidder")*

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

(____) a partnership

(____) a joint venture

(____) an individual
doing business as _____

To the Town of Wilmington, Massachusetts (hereinafter called "Owner"):

The undersigned Bidder, in compliance with your invitation for bids for the project known as *Pilcher Drive Pump Station Wastewater Grinder Installation*, having examined the plans and specifications and related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents and the plans and specifications within the time set forth below, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this bid is a part.

The Bidder hereby agrees to commence work on or before the date to be specified in written "Notice to Proceed" of the Owner, and to fully complete the project within the number of days stated in Section 00500, Agreement. The Bidder further agrees to pay as liquidated damages the amount stated in Section 00500, Agreement, for each consecutive calendar day thereafter that the work is not complete as provided in the contract.

*Specify corporation, partnership or individual as applicable.

Bidder acknowledges receipt of and this bid includes the following addenda:

No.

Dated:

Bid Items:

1. Site Work (Lump Sum) \$_____

(Writing Amount)

2. Pump Station Wastewater Grinder Installation (Lump Sum) \$_____

(Writing Amount)

3. New Sanitary Sewer Manhole and 15-inch Gravity Sewer (Lump Sum) \$_____

(Writing Amount)

4. Cured-in-Place Spot Repair (CIPSR) Liner (Lump Sum) \$_____

(Writing Amount)

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

The Bidder understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 149 and Chapter 30, Section 39M, as amended.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Within 10 days of receipt of the written notice of acceptance of this bid, the Bidder will execute the formal Agreement set forth in Section 00500 AGREEMENT.

Bid security is attached in the sum of five percent (5%) of the total bid in accordance with the conditions of Section 00100 INSTRUCTIONS TO BIDDERS. The bid security may become the property of the Owner in the event the contract and bond are not executed within the time set forth above.

The selected Contractor shall furnish a performance bond and a payment bond in an amount at least equal to one hundred percent (100%) of the contract price in accordance with Section 00610 PERFORMANCE BOND, Section 00620 PAYMENT BOND, and as stipulated in the contract.

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 name for ____ years.
2. The names and addresses of all persons interested in the bid (if made by a partnership or corporation) as principals, are as follows:

(attach supplementary list if necessary)

3. The bidder is requested to state below what work of a similar character to that included in the proposed contract he has done, and give references that will enable the Owner to judge his experience, skill and business standing (add supplementary page if necessary).

<u>Completion Date</u>	<u>Project Name</u>	<u>Contract Amount</u>	<u>Design Engineer</u>	<u>Reference Name</u>	<u>Telephone No.</u>
a.					
b.					
c.					
d.					
e.					
f.					

4. Bank reference _____
(Name)

(Bank)

(Address)

(Telephone No.)

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SECTION 00500

AGREEMENT

THIS AGREEMENT made this _____ day of _____
in the year _____, between _____, with a
usual place of business at _____, hereinafter
called the CONTRACTOR, and the Town of Wilmington, acting by its Department of Public
Works, with a usual place of business at 121 Glen Road, Wilmington, MA 01887, hereinafter
called the OWNER.

The CONTRACTOR and the OWNER, for the consideration hereinafter named, agree as follows:

1. Scope of Work

The Contractor shall furnish all labor, materials, equipment and insurance to perform all work required for the project known as the Pilcher Drive Pump Station Wastewater Grinder Installation, in strict accordance with the Contract Documents and all related Drawings and Specifications. The said Documents, Specifications, Drawings and any GENERAL and SUPPLEMENTARY CONDITIONS are incorporated herein by reference and are made a part of this Agreement.

2. Contract Price

The Owner shall pay the Contractor for the performance of this Agreement, subject to additions and deductions provided herein, in current funds, the sum of _____.

3. Commencement and Completion of Work and Liquidated Damages

It is agreed that time is of the essence of this Agreement. The Contractor shall commence and prosecute the work under this Agreement upon execution hereof and shall complete the work within 90 calendar days of _____.

- A. Definition of Term: The Term "Substantial completion" shall mean the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the project, or designated portion(s) thereof, for the use for which it is intended.
- B. Time as Essential Condition: It is understood and agreed that the commencement of and substantial completion of the work are essential conditions of this Agreement. It is further agreed that time is of the essence for each and every portion of the Contract

Documents wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract Documents any additional time is allowed for the completion of any work, the new time fixed by such extension shall be of the essence of this Agreement. It is understood and agreed that the times for the completion of the work are reasonable, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

- C. Progress and Completion: Contractor shall commence work promptly upon execution of this Agreement and shall prosecute and complete the work regularly, diligently and uninterruptedly at such a rate of progress as will insure Substantial Completion within the stipulated number of calendar days.
- D. Liquidated Damages: It is expressly agreed between the Contractor and the Owner that the Contractor will be responsible for all damages which may arise due to the Contractor's failure to substantially complete the work within the above specified time. If the Contractor shall neglect, fail or refuse to complete the work within the specified number of days, or any extension thereof authorized by the Owner, Contractor agrees, as a part of the consideration for the execution of this Contract by the Owner, to pay the Owner the amount specified herein, not as a penalty, but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day, excluding Saturdays, Sundays and legal Holidays, that the Contractor shall be in default of Substantial completion after the date specified in the Agreement. Due to the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, said amount is agreed to be the amount of damages which the Owner would sustain, and said amount shall be retained from time to time by the Owner from current periodic estimates. The amount of liquidated damages shall be \$1,200 per day.

4. Performance of the Work

- A. Direction of the Work: The Contractor shall supervise and direct the Work, using his best skills and attention which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall maintain adequate supervisory personnel at the project site during the performance of the Work. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Agreement.
- B. Responsibility for the Work: (1) The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor. This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the work.

(2) The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in its administration of the Agreement, or by inspections, tests or approvals required or performed by persons other than the Contractor.

- C. **Permits and Fees:** Unless otherwise expressly provided, the Contractor shall secure and pay for all permits and fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Agreement and which are legally required at the time the bids are received, and the same shall at all times be the property of the Owner and shall be delivered to the Owner upon completion of the Project.
- D. **Notices, Compliance With Laws:** (1) The Contractor shall give all notices and comply with all federal, state and local laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work. The Contractor shall provide the Owner with reproductions of all permits, licenses and receipts for any fees paid. The Owner represents that it has disclosed to the Contractor all orders and requirements known to the Owner of any public authority particular to this Agreement.
- (2) If the Contractor observes that any of the Contract Documents are at variance with applicable laws, statutes, codes and regulations in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be accomplished by appropriate modification.
- (3) If the Contractor performs any Work which he knows or should know is contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility therefor and shall bear all costs attributable thereto.
- (4) In the performance of the Work, the Contractor shall comply with all applicable federal, state and local laws and regulations including those relating to workplace and employee safety. The Contractor shall notify the Owner immediately of any conditions at the place of the work which violate said laws and regulations and shall take prompt action to correct and eliminate any such violations.
- E. **Project Superintendent:** The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.
- F. **Progress Schedule:** The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Owner's information an estimated progress schedule for the Work. The progress schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.
- G. **Drawings, Specifications and Submittals:**
- (1) The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, and "As-Built" Drawings and Specifications in good order and marked currently

to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be delivered to the Owner upon completion of the Work.

(2) By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

(3) The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Owner's approval of Shop Drawings, Product Data or Samples unless the Contractor has specifically informed the Owner in writing of such deviation at the time of submission and the Owner has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Owner's approval thereof.

(4) The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner on previous submittals.

(5) No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Owner. All such portions of the Work shall be in accordance with approved submittals.

- H. Protection of the Work and Owner's Property: The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Agreement. He shall at all times safely guard and protect his own work, and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury. The Contractor shall clean the work area and restore it to its original condition upon completion of the work.
- I. Quality of the Work: The Contractor shall perform the work in a good, workmanlike manner. The Contractor hereby guarantees that the entire work constructed by him under the Agreement will meet fully all requirements thereof as to quality of workmanship and materials. The Contractor hereby agrees to make at his own expense any repairs or replacements made necessary by defects in materials or workmanship supplied to him that become evident within one (1) year after the date of the final payment, and to restore to full compliance with the requirements set forth herein any part of the work constructed hereunder, which during said one (1) year period is found to be deficient with respect to any provisions of the Contract Documents. The Contractor also agrees to hold the Owner harmless from claims of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written orders for same from the Owner. If the Contractor fails to make the repairs and replacements promptly, the Owner may do the work and the Contractor shall be liable to the Owner for the cost thereof.

- J. Warranty: The Contractor guarantees to Owner that all materials incorporated into the work will be new unless otherwise specified or agreed. Prior to final payment, the Contractor shall deliver to the Owner all manufacturers' warranties, together with such endorsements or assignments as are necessary to ensure to the Owner the full rights and benefits of such warranties.

5. Affirmative Action/Equal Employment Opportunity

The Contractor is directed to comply with all applicable State Laws, Ordinances, Bylaws, and rules and regulations regarding affirmative action/equal employment opportunity requirements. Failure of the Contractor to comply with any such law, rule or regulation shall constitute grounds for the Owner to terminate the Agreement.

6. Site Information Not Guaranteed; Contractor's Investigation

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of the Contractor and is not guaranteed.

It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

Contractor has familiarized himself with the nature and extent of the Contract Documents, work, locality, and with all local conditions and federal, state, and local laws, rules, ordinances, and regulations that in any manner may affect costs, progress, or performance of the work. Contractor has made, or has caused to be made, examinations, investigations, and tests and studies of such reports and related data in addition to those referred to in the paragraph above as he deems necessary for the performance of the work at the Contract Price, within the Contract Time, and in accordance with the other Terms and Conditions of the Contract Documents; and no additional examinations, tests, investigations, reports, and similar data are or will be required by the Contractor for such purposes.

Contractor has correlated the results of all such observations, examinations, investigations, tests, reports, and data with the Contract Documents. Contractor has given the Owner written notice of all conflicts, errors, or discrepancies that he has discovered in the Contract Documents, and the resolution thereof by the Owner is acceptable to the Contractor.

It is further agreed and understood that the Contractor shall not use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner, arising from or by reason of any variance which may exist between the information made available and the actual subsurface conditions or other conditions or structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

7. Project Engineer

The Project has been designed by Arcadis, U.S., 500 Edgewater Drive, Suite 511, Wakefield, MA 01880 (hereafter referred to as Engineer). Except as otherwise indicated in the Contract Documents, the Engineer shall be a representative of the Owner and the Contractor shall direct all communications, questions and comments on the work and the performance thereof to the Engineer. Except as otherwise provided, the Engineer shall have all the authority of the Owner set forth in the Contract Documents. In general, the Engineer shall have the authority to review the performance of the work, reject work which is defective or otherwise does not comply with the Contract Documents and to order the Contractor to remedy defective work and take such actions which are necessary to make the work conform to the Contract Documents.

8. Wage Rates

Prevailing Wage Rates as determined by the Commissioner of the Department of Labor and Workforce Development under the provisions of Massachusetts General Laws, Chapter 149, Section 26 to 27G, as amended, apply to this project. It is the responsibility of the Contractor to provide the Town with certified payrolls and to comply with all requirements of the above-cited statutes.

The schedules of prevailing wage rates are included in the Contract Documents.

9. Payments to the Contractor

Within fifteen (15) days after receipt from the Contractor of a proper and satisfactory periodic estimate requesting payment of the amount due for the preceding month, the Owner shall have fifteen (15) days to make payment for:

- A. The work performed during the preceding month.
- B. 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 Owner.
- C. Less the following retention items:
 - 1. A retention based on an estimate of the fair value of the Owner's claims against the Contractor.
 - 2. A retention for direct payments to Subcontractors, if any, based on demands for same in accordance with the provisions of Section 39F of Chapter 30 of the General Laws.
 - 3. A retention not exceeding five percent (5%) of the approved amount of the periodic payment.

- D. After the receipt of a periodic estimate requesting final payment and within sixty-five (65) days after the Contractor fully completes the Work, or substantially completes the Work so that the value of the Work remaining to be done is, on the estimate of the Owner, less than 1% of the original Contract Price, or substantially completes the Work and the Owner takes possession or occupancy, whichever occurs first, the Owner shall pay the Contractor the entire balance due on the Contract less:
1. A retention based on an estimate of the fair value of the Owner's claims against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work.
 2. A retention for direct payments to Subcontractors, if any, based on demands of same in accordance with the provisions of Section 39F of Chapter 30 of the General Laws, or based on the record of payments by the Contractor to the Subcontractors under this Contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in Section 39F of Chapter 30 of the General Laws.

If the Owner fails to make payment as herein provided, there shall be added to each such payment, daily interest at the rate of 3 percentage points above the rediscount rate then 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 of a periodic estimate for final payment until fifteen (15) days after receipt of such a periodic estimate by the Owner as provided in the first paragraph of this Article. The Contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The Owner 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, and such changes and any requirements 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 further, that the Owner may, within seven (7) days after receipt, return to the Contractor for correction, any periodic estimate which is not in acceptable 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.

- E. Changes in the Work: No changes in the work covered by the approved Contract Documents shall be made without prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:
- (a) Unit bid prices previously approved.
 - (b) An agreed lump sum.

- (c) The actual cost of:
 - (1) Labor.
 - (2) Materials entering permanently into the work.
 - (3) The ownership or rental cost of construction equipment during the time of use on the extra work.
 - (4) Power and consumable supplies for the operation of power equipment.
 - (5) Wages to be paid.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) of the actual cost of work. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit and any other general expenses.

- F. Claims for Additional Costs: If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the Owner written notice thereof within twenty days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property. No such claim shall be valid unless so made. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Town on account of any delay in the commencement or performance of the work and/or any hindrance, delay or suspension of any portion of the work including, but not limited to, any claims or damages on account of having to perform out of sequence work, claims for damages on account of loss of production or other interference with the work whether such delay is caused by the Town or otherwise, except as and to the extent expressly provided under G.L. c.30, §39O in the case of written orders by the Town. The Contractor acknowledges that the Contractor's sole remedy for any such claim will be an extension of time as provided herein.

10. Final Payment, Effect

The acceptance of final payment by the Contractor shall constitute a waiver of all claims by the Contractor arising under the Agreement.

11. Contract Documents

The Contract Documents consist of the following, together with this Agreement:

Invitation for Bids
Instructions to Bidders
This Contract Form
Bid Form

Performance Bond
Labor & Materials Payment Bond
Non-Collusion Certificate
Tax Compliance Certificate
Clerk's Certificate of Corporate Vote
Certificate of Insurance
General Conditions
Supplementary General Conditions
General Requirements
Specifications and Addenda
Contract Drawings
Schedule of Prevailing Wages

12. Terms Required By Law

This Agreement shall be considered to include all terms required to be included in it by the Massachusetts General Laws, and all other laws, as though such terms were set forth in full herein.

13. Indemnification

The Contractor shall indemnify and hold harmless the Owner and Engineer from and against any and all claims, damages, losses, and expenses, including attorney's fees, arising out of the performance of this Agreement when such claims, damages, losses, and expenses are caused, in whole or in part, by the acts, errors, or omissions of the Contractor or his employees, agents, subcontractors or representatives.

14. Insurance

The Contractor shall purchase and maintain such insurance as will protect the Owner, Contractor, and Engineer from claims which may arise under the Agreement, including operations performed for the named insured by independent contractors and general inspection thereof by the named insured. In addition, the Contractor shall require its subcontractors to maintain such insurance. Coverage shall be provided for:

- .1 claims under workers' or workmen's compensation, disability benefit and other applicable employee benefit acts;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

- .5 claims for damages, including damages to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and
- .6 claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- .7 claims involving contractual liability applicable to the Contractor's obligations under Article 13.

The limits of liability for coverage required under the preceding paragraph shall be as Specified in the Supplemental Conditions.

Except for Workmen's Compensation, all liability coverage shall name the Town and Arcadis as an additional insured and shall provide for 30 days prior written notice to the Town of any modification or termination of coverage provided thereby. The Contractor shall provide the Owner with appropriate certificate(s) of insurance evidencing compliance with this provision prior to the commencement of any work under this Agreement.

15. Notice

All notices required to be given hereunder shall be in writing and delivered to, or mailed first class to, the parties' respective addresses stated above. In the event that immediate notice is required, it may be given by telephone or facsimile, but shall, to the extent possible, be followed by notice in writing in the manner set forth above.

16. Termination

- A. Each party shall have the right to terminate this Agreement in the event of a failure of the other party to comply with the terms of the Agreement. Such termination shall be effective upon seven days' notice to the party in default and the failure within that time of said party to cure its default.
- B. The Owner shall have the right to terminate the Agreement without cause, upon ten (10) days' written notice to the Contractor. In the event that the Agreement is terminated pursuant to this subparagraph, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work performed up to the termination date, and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. Payment for material or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interests.

17. Miscellaneous

- A. Royalties and Patents: The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner

harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified; but if the Contractor believes or has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner, and thereafter the Owner insists on the use of the design, process or products specified.

- B. Assignment: The Contractor shall not assign or transfer any of its rights, duties or obligations under this Agreement without the written approval of the Owner.
- C. Governing Law: This Agreement shall be governed by and construed in accordance with the law of the Commonwealth of Massachusetts.
- D. By its signature hereon, the Contractor certifies, under the pains and penalties of perjury, that it has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

[Remainder of page intentionally blank.]

AGREED:

TOWN OF WILMINGTON, MASSACHUSETTS
(Owner)

By its _____

CONTRACTOR: _____

By _____

(Name)

(Title)

(Address)

(City and State)

Approved as to Form:

By _____
(Owner's Counsel)

In accordance with G.L. c.44, Section 31C, this is to certify that an appropriation in the amount of this contract is available therefor and that the _____ has been authorized to execute the contract and approve all requisitions and change orders.

By _____
(Owner's Accountant)

(Name)

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

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

and acting Secretary of _____ and I further certify that a meeting of the

(Name of Corporation)

Directors of said Company, duly called and held on _____, at which
(Date of Meeting)

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

VOTED: To authorize and empower

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

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

By: _____
(Secretary of Corporation)

A True Copy:

Attest: _____
(Notary Public)

My Commission Expires: _____
(Date)

**CERTIFICATIONS REQUIRED BY LAW
FOR PUBLIC CONSTRUCTION CONTRACTS**

You must COMPLETE and SIGN the following certifications. You must also print, at the bottom of this page, the name of the contractor for whom these certifications are submitted.

TAX COMPLIANCE

Pursuant to Chapter 62C of the Massachusetts General Laws, Section 49A(b), I, the undersigned, authorized signatory for the below named contractor, do hereby certify under the pains and penalties of perjury that said contractor has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

NON-COLLUSION

The undersigned certifies under the 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 subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

PUBLIC CONTRACTOR DEBARMENT

The undersigned certifies under penalty of perjury that the below named contractor 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.

OSHA TRAINING

Pursuant to G.L. c. 30, §39S, the Contractor hereby certifies under penalties of perjury as follows:

- (1) Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
- (2) 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 they shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and
- (3) All employees to be employed in the work subject to this contract 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.

COMPLETE AND SIGN BELOW:

Authorized Person's Signature

Date

Print Name & Title of Signatory

Name of Contractor

SECTION 00610

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)

a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual)

_____ of _____, State of _____
(Surety) (City & State)

_____ hereinafter called the "Surety" and licensed by the State
Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are
held and firmly bound to the Town of Wilmington, Massachusetts, hereinafter called "Owner", in
the penal sum of _____ Dollars
(\$ _____) in lawful money of the United States, for the payment of which
sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and
successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered
into a certain contract with the Owner, dated the _____ day of _____,
20__ (the "Construction Contract"), for the construction described as follows: *Pilcher Drive
Pump Station Wastewater Grinder Installation*.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the
undertakings, covenants, terms, conditions, and agreements of the Construction Contract during
the original term thereof, and any extensions thereof which may be granted by the Owner, with
or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the
Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and
damages which it may suffer by reason of failure to do so, and shall reimburse and repay the
Owner all outlay and expense which the Owner may incur in making good any default, then this
obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after (1) the
Owner has declared the Principal in default of the Construction Contract or any provision thereof
or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute
the work consistent with, and in conformance to, the Construction Contract (collectively referred
to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by
the Owner. The Owner need not terminate the Construction Contract to declare a Contractor
Default or to invoke its rights under this Bond.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall promptly take one of the following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract; (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract. Surety will keep Owner reasonably informed of the progress, status and results of any investigation of any claim of the Owner.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorneys' fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; (4) indemnification obligation of the Principal, if any, as provided in the Construction Contract; and (5) liquidated damages as provided in the Construction Contract, or if none are so specified, actual and foreseeable consequential damages resulting from the Contractor Default or default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

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

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

ATTEST:

_____	By	_____
(Principal Secretary)		Principal

		(Address-Zip Code)

_____ (SEAL)
Witness as to Principal

(Address-Zip Code)

ATTEST:

_____	By	_____
		Surety

		(Attorney-in-Fact)

		(Address-Zip Code)

_____ (SEAL)
Witness as to Surety

(Address-Zip Code)

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

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SECTION 00620

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

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

hereinafter called "Principal" and _____ of _____,
(Surety)

State of _____ hereinafter called the "Surety" and licensed by the State
(City and State)

Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Town of Wilmington, Massachusetts, hereinafter called "Owner", in the penal sum of _____ Dollars (\$ _____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20____, for the construction described as follows: *Pilcher Drive Pump Station Wastewater Grinder Installation.*

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

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

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

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

ATTEST:

_____	By	_____ Surety
		_____ (Attorney-in-Fact)
		_____ (Address-Zip Code)
_____ (SEAL)		
Witness as to Surety		

(Address-Zip Code)		

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

SECTION 0700

STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

Adapted from EJCDC C-700, Standard General Conditions
of the Construction Contract (2013 Edition)

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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 form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting 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, or both; 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, or both; 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; or (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. 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), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree 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 the 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. *Engineer*—The individual or entity named as such in the Agreement.
21. *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.
22. *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. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws

and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *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.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *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.
28. *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.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
30. *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.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
33. *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.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *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.
36. *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.
37. *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 furnished by Owner which are designated for the use of Contractor.
38. *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.
39. *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.
40. *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 thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, 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.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *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.
48. *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 the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
 1. 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:*
 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
 1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or

- b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. 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 15.04).
- E. *Furnish, Install, Perform, Provide:*
 - 1. The word "furnish," when used in connection with services, materials, or equipment, shall mean 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, shall mean 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, shall mean 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. 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 Bonds and Evidence of Insurance*

- A. *Bonds:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor's Insurance:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner's Insurance:* After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), 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 executed 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 specifically 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 *Initial 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 for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall 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.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items 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 items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one 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 or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall 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.

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 1. 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, shall mean 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, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, 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, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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 Documents 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 Documents 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

shall 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 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 thereunder.
- 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 give written notice to Owner and Contractor 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:
 1. 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 editions, 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 shall preclude 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 thirtieth 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 sixtieth day after the day of Bid opening or the thirtieth 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 shall 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 shall 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 shall 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 the Contract Times and Contract Price.

Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the 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. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall 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 utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 - 4. acts of war or terrorism.
- D. 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.
- E. Paragraph 8.03 governs 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.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times 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.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor 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; 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 7.12, 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 at law; 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 shall 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 known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); 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 upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. 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; or
 - 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.

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 either:
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; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. 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 the necessity of Owner's obtaining 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 above; 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. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, 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 conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
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; or
 - 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 as 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, or both, then any such adjustment shall 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, or both, 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.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. 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 in the Contract

Documents, or was not shown or indicated 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), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; 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 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. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, 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. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - 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;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. 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, or both, then any such adjustment shall 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, or

both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
2. 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 Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. 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; or
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 in question, then Owner may remove and remediate 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, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, 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.
- 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 or 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 shall obligate 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 is responsible. Nothing in this Paragraph 5.06.J shall obligate 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 all of Contractor's obligations under the Contract. These bonds shall 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 Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, 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 shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. 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.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

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. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements 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 and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements 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 and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. 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, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of 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.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect 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 shall be adjusted accordingly.

- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
 - 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 - 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 - 2. claims for damages insured by reasonably available personal injury liability coverage.
 - 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
 - 1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 - 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 - 3. Broad form property damage coverage.
 - 4. Severability of interest.
 - 5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
 - E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
 - F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
 - G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
 - H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
 - I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
 1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 4. remain in effect at least until final payment (and longer if expressly required in this Article) 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 Documents.
 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed 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.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. 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.

6.05 *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 full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
6. extend to cover damage or loss to insured property while in transit.
7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
8. allow for the waiver of the insurer's subrogation rights, as set forth below.
9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
10. not include a co-insurance clause.
11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed 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.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- 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 notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* 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 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers 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. 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 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 Subcontractors, all individuals or entities identified in the Supplementary Conditions as 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. None of the above waivers shall extend 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. 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:
 - 1. loss 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 perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner 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.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work 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 any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 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 6.05 shall 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, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

7.01 *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. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *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 at all times maintain good discipline and order at the Site.
- B. 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 shall 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.

7.03 *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 shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall 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 shall 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.

7.04 “Or Equals”

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, 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 material or equipment, or items from other proposed suppliers under the circumstances described below.
1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an “or equal” item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it 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) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it 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 shall result in any change in Contract Price. The Engineer’s denial of an “or-

equal” request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment 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 material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
1. 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 material or equipment from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.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 material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall 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 that specified, and
 - 3) be suited to the same use as that 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 that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall 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 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 shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities 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, Supplier, or other individual or entity 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 five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. 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, Suppliers, or other individuals or entities 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, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, 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, Supplier, or other individual or entity, whether initially or as a replacement, shall 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 fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or

Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create 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.

7.07 *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 a particular 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 shall be disclosed by Owner 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.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. 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

7.09 *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.

7.10 *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. Except where otherwise expressly required by applicable Laws and Regulations, 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 shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give 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 notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *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.

7.12 *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. 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.
- B. 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. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when 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.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. 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.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.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).
- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall 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.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of 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 threatened 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 thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified 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
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall 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 submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a

written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
 - 1. *Shop Drawings:*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings will 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.D.
 - 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.D.
 - 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. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
 - 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. 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, conform to the information given in 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 shall 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.
5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 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, shall 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, Sample, or other submittal shall 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.D.4.

E. *Resubmittal Procedures:*

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 submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

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 and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, modification, or improper 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.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 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. any inspection, test, or approval by others; or
 - 8. any correction of defective Work by Owner.
- D. 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 shall 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 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 performance of the Work, provided that any such claim, cost, loss, or damage 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 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 shall 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.

- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

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 utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. 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.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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.

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 at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible 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, or both. 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 shall 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. When applicable, any such equitable adjustment in Contract Price shall 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 is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- 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. 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 to 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.
- C. 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 to Contractor.
- D. 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 shall 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 Documents (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 10.08. 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 *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 Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *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.

10.07 *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.

10.08 *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, shall 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 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 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *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 (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not 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, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 - 2. *Work Change Directives:* 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 11.04 regarding change of Contract

Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: 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. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *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. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes 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 shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate 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.

11.03 *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.

11.04 *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 shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall 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); or

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 11.04.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 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall 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 shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five 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 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.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 five 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 shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall 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 will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *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 shall comply with the provisions of

Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
 - 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. 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. The supporting data shall 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. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 - 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall 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.
 - 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *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 that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the 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 11.02, (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 in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *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 shall be submitted 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; and
 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.
- 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 shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, 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 shall 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 shall 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 shall 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 shall resume as of the date of the conclusion 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 shall 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 shall 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 shall be incorporated in a Change Order 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. 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 shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall 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. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, 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, shall 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 shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall 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, who 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 shall 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 for services specifically related to the Work.
5. Supplemental costs including 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, and hand tools not owned by the workers, 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.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the 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 property insurance established in accordance with Paragraph 6.05), 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 shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall 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 shall not include any of the following items:
1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, 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. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. 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.
 5. 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*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

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 on account of any of the foregoing will be valid.

- C. *Contingency Allowance*: Contractor agrees that a 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 on account of Work covered by allowances, and the Contract Price shall 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, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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 will 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 therewith 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 shall 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 shall 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 shall 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 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 shall 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.
 - 1. 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, or both, 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 shall 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 rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven 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 on account of 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. 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 shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and 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.
 - 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications:*

1. 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, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

- d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, 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 on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of 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 that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated 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;
 - l. there are other items entitling 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 shall 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 shall be treated as an amount due as determined by Paragraph 15.01.C.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 seven 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 shall 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 seven 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 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 6.05 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 7.11), and other documents, Contractor may make application for final payment.
2. The final Application for Payment shall 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 disputes that Contractor believes are unsettled; 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 Application and Acceptance:*

1. 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 ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall 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. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. 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. *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.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, 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.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- 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 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 terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then 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 other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, 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 therefrom.
- B. If 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 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 correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. 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.
- D. 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.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not 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, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall 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) ten 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) 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 seven 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 shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven 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 on account of loss of anticipated overhead, profits, or revenue, 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 seven 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, seven 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; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising 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; or
 - 2. 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 Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

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 shall not constitute a waiver of that provision, nor shall 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 or completion of the Contract or termination 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 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800

SUPPLEMENTAL CONDITIONS

SCOPE

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract. All provisions of the General Conditions that are not so amended or supplemented remain in full force and effect.

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

The address system used in these Supplementary Conditions conforms to the address system used in the General Conditions, with the prefix "SC" added thereto.

SC-1.01.A.52 Add a new definition immediately following Paragraph 1.01.A.51, that is to read as follows:

SC-1.01.A.52 *Consulting Engineer*: The firm of Arcadis U.S., 500 Edgewater Drive, Suite 511, Wakefield, MA 01880, and its duly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

SC-4.02 Delete Paragraph 4.02 in its entirety and add the following in its place:

SC-4.02 In the preparation of the Drawings and Specifications, Engineer did not utilize any report of explorations or tests of subsurface conditions, nor did the Engineer utilize any drawings of physical conditions.

SC-4.06 Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:

SC-4.06.A. In the preparation of the Drawings and Specifications, Engineer has not utilized any report or drawing related to a Hazardous Environmental Condition identified at the Site.

SC-4.06.B (Not Used)

SC-5.04 Add a new paragraph immediately after Paragraph 5.04.B that is to read as follows:

SC-5.04.C The limits of liability for the insurance required by Paragraph 5.04 shall provide coverage for not less than the following amounts, or greater where required by Laws and Regulations:

1. Workers' compensation, and related coverages under Paragraphs 5.04.A.1. and 5.04.A.2.:

- a. Applicable Federal or State: Statutory
 - b. Maritime Not Required
 - c. Railroad Not Required
 - d. Employer's Liability
Each Accident \$1,000,000
- 2. For Contractor's general liability insurance under Paragraphs 5.04.A.3 through 5.04.A.6 and Paragraph 5.04.B which shall include Premises-Operations, Independent Contractor's Protection, Products and Completed Operations, Broad Form Property Damage, Contractual Liability):
 - a. Bodily Injury:
 - \$1,000,000 Each Occurrence
 - \$1,000,000 Annual Aggregate
 - b. Property Damage:
 - \$1,000,000 Each Occurrence
 - \$1,000,000 Annual Aggregate
 - c. Property Damage liability insurance shall provide Explosion, Collapse and Underground coverages.
- 3. For Contractor's Automobile Liability under Paragraph 5.04.A.6:
 - a. Bodily Injury:
 - \$1,000,000 Each Person
 - \$1,000,000 Each Accident
 - b. Property Damage:
 - \$1,000,000 Each Occurrence
 - Combined Single Limit of \$5,000,000

SC-5.06 through SC-5.09, inclusive.

Add new paragraphs immediately after Paragraph 5.05 that are to read as follows:
SC-5.06. *Property Insurance*

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost of the Work. This insurance shall:
 - 1. include the interests of Owner, Contractor, Subcontractors, Engineer, Consulting Engineer and other individuals or entities identified herein, and the officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured, additional insured, or loss payee as their interest may appear;
 - 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and

malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood) and electrical breakdown or failure an damage to electrical apparatus from electrical currents.

3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. Allow for partial utilization of the Work by Owner;
 6. Include testing and start-up; and
 7. Be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.
- B. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph SC-5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured or loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph SC-5.07.
- C. The risk of loss within any deductible amount applicable to the policies of insurance purchased in accordance with this Paragraph SC-5.06 will be borne by Contractor, Subcontractors, or others suffering such loss.

SC-5.07. Waiver of Rights

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph SC-5.06 will protect Owner, Contractor, Subcontractors, Engineer, Consulting Engineer, and all other individuals or entities identified in Paragraph SC-5.06 to be listed as insureds or additional insured or loss payees (and the officers, directors, members, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment

of loss or damage the insurers will have no rights of recovery against any of the insureds or additional insured or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents and other 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 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 Subcontractors, Engineer, Consulting Engineer and all other individuals or entities identified in Paragraph SC-5.06 to be listed as insureds or additional insureds or loss payees (and the officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

- B. Owner waives all rights against Contractor, Subcontractors, Engineer, Consulting Engineer, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:
 - 1. loss 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 and other perils whether or not insured by Owner, and;
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04 or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage, or consequential loss referred to in Paragraph SC-5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, Engineer, Consulting Engineer, and the officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them.

SC-5.08. *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph SC-5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, additional insureds or loss payees as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph SC-5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

SC-5.09. *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph SC-5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

SC-6.02.B Add new paragraphs immediately after Paragraph 6.02.B that are to read as follows:

SC-6.02.B.1 Except where otherwise prohibited by Laws or Regulations, regular working hours at the Site are defined as up to eight hours per day, beginning no earlier than 7:00 a.m. and ending no later than 5:00 p.m.

SC-6.02.B.2 Maintenance and cleanup activities may be performed during hours other than regular working hours provided that such activities do not require the startup or operation of construction equipment.

SC-6.02.B.3 If it shall become absolutely necessary to perform Work at night or on Saturdays, Sundays, or legal holidays, written notice shall be submitted to Owner and Engineer at least three days in advance of the need for such Work. Owner will only consider the performance of such Work as can be performed satisfactorily under the conditions. Good lighting and all other necessary facilities for carrying out and observing the Work shall be provided and maintained where such Work is being performed at night.

SC-6.07.B Change the first sentence of Paragraph 6.07.B by replacing the term “Owner and Engineer” with the term “Owner, Engineer, and Consulting Engineer”.

SC-6.09. Add a new paragraph immediately after Paragraph 6.09.C that is to read as follows:

SC-6.09.D Refer to Article SC-18 for Laws and Regulations that, by terms of said Laws and Regulations, are to be included in the Contract Documents. The failure to include in Article SC-18 any Law or Regulation applicable to the performance of the Work does not diminish Contractor’s responsibility to comply with all Laws and Regulations applicable to the performance of the Work.

SC-6.10. Add a new paragraph immediately after Paragraph 6.10.A, that is to read as follows:

SC-6.10.B Owner is exempt from payment of sales and compensating use taxes of the State of Massachusetts and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption 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-6.12 Add a new paragraph immediately after Paragraph 6.12.A that is to read as follows

SC-6.12.B Contractor will be required to review with Engineer the status of record documents in connection with the Engineer’s review of an Application of Payment. Failure to maintain record documents current may be just cause for Engineer to recommend withholding of payments for work performed.

SC-6.15 Add a new paragraph immediately after Paragraph 6.15.A that is to read as follows:

SC-6.15.B Contractor shall be responsible for coordinating exchange of 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 all Laws and Regulations. Contractor shall provide a centralized location for the maintenance of the material safety data sheets or other hazard communication information required to be made available by any employer on the Site. Location of the material safety data sheets or other hazard communication information shall be readily accessible to the employees of employers on the Site.

SC-6.17 Add the following new paragraphs immediately after Paragraph 6.17.E that are to read as follows:

SC-6.17.F Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval or acceptance of submittal with no more than three submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, Samples, or other submittals or items requiring approval or acceptance, and Contractor shall reimburse Owner for Engineer's charges for such time.

SC-6.17.G In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time unless the need for such substitution is beyond the control of Contractor.

SC-6.19.A Supplement Paragraph 6.19.A by adding, after the term, "Engineer" in the second sentence, the term "and Consulting Engineer".

SC-6.20.A. Change the first sentence of Paragraph 6.20.A by replacing the term "Owner and Engineer" in the first sentence, with the term ", Owner, Engineer, and Consulting Engineer".

SC-6.20.B Change the first sentence of Paragraph 6.20.B by replacing the term "Owner or Engineer" with the term "Owner, Engineer or Consulting Engineer".

SC-7.03 Add a new paragraph immediately after Paragraph 7.02 that is to read as follows:

SC-7.03 *Separate Contractor Claims*

A. Should Contractor cause damage to the work or property of another contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any other contractor against Contractor, Owner or Engineer Consulting Engineer, Contractor, without involving any other party, shall either:

1. remedy the damage,

2. agree to compensate the other contractor for remedy of the damage, or
 3. remedy the damage and attempt to settle with such other contractor by agreement, or otherwise resolve the dispute by arbitration or at law.
- B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Engineer, Consulting 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 directly, indirectly, or consequentially out of or relating to any claim or action, legal or equitable, brought by any other contractor against Owner or Engineer and Consulting Engineer to the extent said claim is based upon Contractor's performance of the Work.
- C. Should another contractor cause damage to the Work or property of Contractor at the Site or should the performance of work by any other contractor at the Site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner or Engineer and Consulting Engineer, or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner or Engineer and Consulting Engineer on account of any such damage or claim.
- D. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of another contractor and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim therefore in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner or Engineer and Consulting Engineer for any delay, disruption, interference, or hindrance caused by any other contractor.

SC-9.03 Add a new paragraph immediately after Paragraph 9.03.A that is to read as follows:

SC-9.03.B Resident Project Representative (RPR) will be Engineer's employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor keeping Owner advised as necessary. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval

of Contractor. RPR shall generally communicate with Owner with the knowledge of and under the direction of Engineer.

1. Duties and Responsibilities to RPR:

- a. Schedules: Review the Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
- b. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
- c. Liaison:
 - 1) Serve as Engineer's liaison with Contractor, working principally through Contractor's superintendent, and assist in providing understanding of the intent of the Contract Documents; and assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's operations on the Site.
 - 2) Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
- d. Shop Drawings and Samples:
 - 1) Record date of receipt of Shop Drawings and Samples that are received at the Site.
 - 2) Receive Samples that are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
 - 3) Advise Engineer and Contractor of the commencement of any Work requiring a Shop Drawing or Sample if the submittal has not been approved by Engineer.
- e. Review of Work, Rejection of Defective Work, Inspections and Tests:
 - 1) Conduct observations of the Work in progress on the Site to assist Engineer in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
 - 2) Report to Engineer when RPR believes that any Work is unsatisfactory, faulty, or defective or does not conform generally to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made; and advise Engineer of Work that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
 - 3) Verify that tests, equipment, and systems startups, and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof; and observe, record, and report to Engineer appropriate details relative to the test procedures and startups.
 - 4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to Engineer.

- f. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
- g. Modifications: Consider and evaluate Contractor's suggestions for modifications to Drawings or Specifications and report with RPR's recommendations to Engineer. Transmit to Contractor decisions issued by Engineer.
- h. Records:
 - 1) Maintain at the Site orderly files for correspondence, reports of job conferences, Shop Drawings and Samples, and reproductions of original Contract Documents including all Addenda, Change Orders, Work Change Directives, Field Orders, additional Drawings issued subsequent to the execution of the Agreement, Engineer's clarifications and interpretations of the Contract Documents, progress reports, and other Project-related documents.
 - 2) Keep a record recording Contractor's hours on the Site, weather conditions, data relative to questions on Change Orders or changed conditions, list of visitors to the Site, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.
 - 3) Record names, addresses, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
- i. Reports:
 - 1) Furnish Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and Schedule of Submittals.
 - 2) Consult with Engineer in advance of scheduled major tests, inspections, or start of important phases of the Work.
 - 3) Prepare draft of proposed Change Orders, obtaining backup documents from Contractor, and provide recommendations to Engineer regarding Change Orders and Field Orders.
 - 4) Report immediately to Engineer and Owner upon the occurrence of any Site accident, any Hazardous Environmental Condition, emergencies or acts of God endangering the Work, or property damage by fire or other cause.
- j. Payment Requests: Review Applications for Payment with Contractor for compliance with the established procedure for their submission, and submit recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
- k. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificates, maintenance and operation manuals, and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the

items actually installed and in accordance with the Contract Documents, and have this material delivered to Engineer for review and forwarding to Owner prior to final payment for the Work.

1. Completion:
 - 1) Before Engineer issues a certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.
 - 2) Observe whether Contractor has arranged for inspections required by Laws and Regulations, including but not limited to those to be performed by public authorities having jurisdiction over the Work.
 - 3) Conduct final inspection in the company of Engineer, Owner, and Contractor, and prepare a final list of items to be completed or corrected.
 - 4) Observe that all items on final list have been completed or corrected and make recommendations to Engineer concerning acceptance of the Work.
2. The RPR shall not:
 - a. Authorize any deviation from the Contract Documents or substitution of materials or equipment, including “or equal” items.
 - b. Exceed limitations of Engineer’s authority as set forth in the Contract Documents.
 - c. Undertake any of the responsibilities of Contractor, Subcontractors, or Contractor’s superintendent.
 - d. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction, unless such advice or directions are specifically required by the Contract Documents.
 - e. Advise on, issue directions regarding, or assume control over safety precautions and programs in connection with the Work.
 - f. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
 - g. Authorize Owner to occupy the Project in whole or in part.
 - h. Participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by Engineer.

SC-16.01 Add new paragraphs immediately after Paragraph 16.01.A that are to read as follows:

SC-16.01.B Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the American Arbitration Association under the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

SC-16.01.C Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

SC-16.01.D If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor,

1. Elects in writing to demand arbitration of the Claim, pursuant to Paragraph SC-16.02, or
2. Agrees with the other party to submit the Claim to another dispute resolution process.

SC-16.02 Add a new paragraph immediately after Paragraph 16.01 that is to read as follows:

SC-16.02 *Arbitration*

- A. All Claims or counter claims, disputes, or other matters in question between Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof (except for Claims that have been waived by the making or acceptance of final payment as provided by Paragraph 14.09), including but not limited to those not resolved under the provisions of Paragraph SC-16.01.B and SC-16.01.C will be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, subject to the conditions and limitations of this Paragraph SC-16.02. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the 30-day period specified in Paragraph SC-16.01.D. and in all other cases within a reasonable time after the Claim or counter claim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or counter claim, dispute, or other matter in question would be barred by the applicable statute of limitations.
- C. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any individual or entity (including Engineer, Consulting Engineer and the officers, directors, partners, employees, agents, or consultants of each and any of them) who is not party to this Contract unless:

1. The inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and
 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings, and
- D. The award rendered by the arbitrator(s) shall be:
1. Consistent with the agreement between the parties, and
 2. In writing, and shall include:
 - a. a concise breakdown of the award, and
 - b. a written explanation of the award specifically citing the Contract Document provisions deemed applicable and relied on in making the award.
- E. Subject to provisions of the Controlling Law relating to vacating or modifying an arbitration award, the award will be final. Judgment may be entered upon it in any court having jurisdiction thereof and it will not be subject to modification or appeal.
- F. The fees and expenses of the arbitrator(s) and any arbitration service shall be shared equally by Owner and Contractor.

SC-18 Add new Article immediately after Article 17, which is to read as follows:

ARTICLE SC-18 – STATUTORY REQUIREMENTS

SC-18.01 This Article contains portions of certain Laws or Regulations which, by provision of Laws or Regulations, are required to be included in the Contract Documents. The material included in this Article may not be complete or current. Contractor's obligation to comply with all Laws and Regulations applicable to the Work is set forth in Paragraph 6.09 of the General Conditions.

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SECTION 00850

Excerpts from Chapter 30, Chapter 82, and Chapter 149 of the Massachusetts General Laws

Certain excerpts from the Massachusetts General Laws are applicable to Construction contracts. Attention is directed to the following Sections of Chapter 149 as amended:

Chapter 30: 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 interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

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

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g) and (h).

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

(3) "Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person

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

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

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

Chapter 30: 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 completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one per cent retainage on that work, including the quantity, price and all but

one per cent retainage 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 on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to

retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one per cent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

Chapter 30: 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 willfully 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.

Chapter 30: 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.

Chapter 30: 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 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 then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149.

Chapter 30: 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 such work with, and shall not approve as a subcontractor furnishing labor and materials for a part of any such work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that such corporation has complied with sections three and five of chapter one hundred and eighty-one and the date of such compliance, 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.

Chapter 30: 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 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 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.

Chapter 30: 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.

Chapter 30: 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.

Chapter 30: 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.

Chapter 30: 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 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.

Chapter 30: Section 39R Definitions; contract provisions; management and 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 A 1/2 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 A 1/2 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.

(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 A 1/2 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).

GENERAL LAWS OF MASSACHUSETTS

CHAPTER 82. THE LAYING OUT, ALTERATION, RELOCATION AND DISCONTINUANCE OF PUBLIC WAYS, AND SPECIFIC REPAIRS THEREON

Chapter 82: 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

Chapter 82: Section 40A Excavations; notice

Section 40A. No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except in an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of

Saturdays, Sundays and legal holidays but not more than 30 days before the proposed excavation is to be made, such excavator has premarked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

The notice requirements shall be waived in an emergency as defined herein; provided, however, that before such excavation begins or during a life-threatening emergency, notification shall be given to the system and the initial point of boring or excavation shall be premarked. The excavator shall ensure that the underground facilities of the utilities in the area of such excavation shall not be damaged or jeopardized.

In no event shall any excavation by blasting take place unless notice thereof, either in the initial notice or a subsequent notice accurately specifying the date and location of such blasting shall have been given and received at least 72 hours in advance, except in the case of an unanticipated obstruction requiring blasting when such notice shall be not less than four hours prior to such blasting. If any such notice cannot be given as aforesaid because of an emergency requiring blasting, it shall be given as soon as may be practicable but before any explosives are discharged.

Chapter 82: Section 40B Designation of location of underground facilities

Section 40B. Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator agree, such company shall respond to the initial notice or subsequent notice by designating the location of the underground facilities within 15 feet in any direction of the premarking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall constitute prima facie evidence of an exercise of reasonable precaution by the company as required by this section; provided, however, that in the event that the excavator has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonably designate the entire location of its facilities within such 72 hour period, then such excavator shall identify for the company that portion of the excavation which is to be first made and the company shall designate the location of its facilities in such portion within 72 hours and shall designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible.

Chapter 82: Section 40C Excavator's responsibility to maintain designation markings; damage caused by excavator

Section 40C. After a company has designated the location of its facilities at the location in accordance with section 40B, the excavator shall be responsible for maintaining the designation markings at such locations, unless such excavator requests remarking at the location due to the obliteration, destruction or other removal of such markings. The company shall then remark such location within 24 hours following receipt of such request.

When excavating in close proximity to the underground facilities of any company when such facilities are to be exposed, non-mechanical means shall be employed, as necessary, to avoid damage in locating such facility and any further excavation shall be performed employing reasonable precautions to avoid damage to any underground facilities including, but not limited to, any substantial weakening of structural or lateral support of such facilities, penetration or destruction of any pipe, main, wire or conduit or the protective coating thereof, or damage to any pipe, main, wire or conduit.

If any damage to such pipe, main, wire or conduit or its protective coating occurs, the company shall be notified immediately by the excavator responsible for causing such damage.

The making of an excavation without providing the notice required by section 40A with respect to any proposed excavation which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima

facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person.

Chapter 82: Section 40D Local laws requiring excavation permits; public ways

Section 40D. Nothing in this section shall affect or impair local ordinances or by-laws requiring a permit to be obtained before excavation in a public way or on private property; but notwithstanding any general or special law, ordinance or by-law to the contrary, to the extent that any permit issued under the provisions of the state building code or state fire code requires excavation by an excavator on a public way or on private property, the permit shall not be valid unless the excavator notifies the system as required pursuant to sections 40 and 40A, before the commencement of the excavation, and has complied with the permitting requirements of chapter 82A.

Chapter 82: Section 40E Violations of secs. 40A -- 40E; punishment

Section 40E. Any person or company found by the department of telecommunications and energy, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined \$500 for the first offense and not less than \$1,000 nor more than \$5,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property.

GENERAL LAWS OF MASSACHUSETTS

Chapter 149: 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 of labor and industries, public necessity so requires. Every such contract not containing the aforesaid stipulation shall be null and void. GENERAL LAWS OF MASSACHUSETTS

Chapter 149: Section 44J 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. 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 or 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.

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Attachment A – Prevailing Wage Rates

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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: Town of Wilmington
Contract Number: **City/Town:** WILMINGTON
Description of Work: Pilcher Drive Pump Station Grinder Installation - Replacement of sanitary sewer pipe, installation of new sanitary sewer manhole and wastewater grinder and associated electrical work.
Job Location: 1A Pilcher Drive, Wilmington, MA 01887

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 Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$34.25	\$12.41	\$12.70	\$0.00	\$59.36
	12/01/2019	\$34.25	\$12.41	\$13.72	\$0.00	\$60.38
	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 <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$34.32	\$12.41	\$12.70	\$0.00	\$59.43
	12/01/2019	\$34.32	\$12.41	\$13.72	\$0.00	\$60.45
	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 <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$34.44	\$12.41	\$12.70	\$0.00	\$59.55
	12/01/2019	\$34.44	\$12.41	\$13.72	\$0.00	\$60.57
	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 <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.70	\$7.85	\$14.88	\$0.00	\$57.43
	12/01/2019	\$35.56	\$7.85	\$14.88	\$0.00	\$58.29
	06/01/2020	\$36.45	\$7.85	\$14.88	\$0.00	\$59.18
	12/01/2020	\$37.34	\$7.85	\$14.88	\$0.00	\$60.07
	06/01/2021	\$38.26	\$7.85	\$14.88	\$0.00	\$60.99
	12/01/2021	\$39.17	\$7.85	\$14.88	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	06/01/2019	\$36.00	\$12.50	\$8.85	\$0.00	\$57.35
	12/01/2019	\$37.00	\$12.50	\$8.85	\$0.00	\$58.35
	06/01/2020	\$38.00	\$12.50	\$8.85	\$0.00	\$59.35
	12/01/2020	\$39.00	\$12.50	\$8.85	\$0.00	\$60.35
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.70	\$7.85	\$14.88	\$0.00	\$57.43
	12/01/2019	\$35.56	\$7.85	\$14.88	\$0.00	\$58.29
	06/01/2020	\$36.45	\$7.85	\$14.88	\$0.00	\$59.18
	12/01/2020	\$37.34	\$7.85	\$14.88	\$0.00	\$60.07
	06/01/2021	\$38.26	\$7.85	\$14.88	\$0.00	\$60.99
	12/01/2021	\$39.17	\$7.85	\$14.88	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2019	\$44.71	\$7.07	\$17.72	\$0.00	\$69.50
	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$29.06	\$7.07	\$11.52	\$0.00	\$47.65
2	65	\$29.06	\$7.07	\$11.52	\$0.00	\$47.65
3	70	\$31.30	\$7.07	\$12.40	\$0.00	\$50.77
4	75	\$33.53	\$7.07	\$13.30	\$0.00	\$53.90
5	80	\$35.77	\$7.07	\$14.18	\$0.00	\$57.02
6	85	\$38.00	\$7.07	\$15.07	\$0.00	\$60.14
7	90	\$40.24	\$7.07	\$15.95	\$0.00	\$63.26
8	95	\$42.47	\$7.07	\$16.84	\$0.00	\$66.38

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total 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:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)	08/01/2019	\$52.26	\$10.75	\$20.70	\$0.00	\$83.71
BRICKLAYERS LOCAL 3 (LOWELL)	02/01/2020	\$52.86	\$10.75	\$20.70	\$0.00	\$84.31
	08/01/2020	\$54.21	\$10.75	\$20.85	\$0.00	\$85.81
	02/01/2021	\$54.81	\$10.75	\$20.85	\$0.00	\$86.41
	08/01/2021	\$56.21	\$10.75	\$21.01	\$0.00	\$87.97
	02/01/2022	\$56.79	\$10.75	\$21.01	\$0.00	\$88.55

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Lowell

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.13	\$10.75	\$20.70	\$0.00	\$57.58
2	60	\$31.36	\$10.75	\$20.70	\$0.00	\$62.81
3	70	\$36.58	\$10.75	\$20.70	\$0.00	\$68.03
4	80	\$41.81	\$10.75	\$20.70	\$0.00	\$73.26
5	90	\$47.03	\$10.75	\$20.70	\$0.00	\$78.48

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.43	\$10.75	\$20.70	\$0.00	\$57.88
2	60	\$31.72	\$10.75	\$20.70	\$0.00	\$63.17
3	70	\$37.00	\$10.75	\$20.70	\$0.00	\$68.45
4	80	\$42.29	\$10.75	\$20.70	\$0.00	\$73.74
5	90	\$47.57	\$10.75	\$20.70	\$0.00	\$79.02

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN	06/01/2019	\$40.25	\$7.85	\$16.05	\$0.00	\$64.15
LABORERS - FOUNDATION AND MARINE	12/01/2019	\$41.25	\$7.85	\$16.05	\$0.00	\$65.15
	06/01/2020	\$42.24	\$7.85	\$16.05	\$0.00	\$66.14
	12/01/2020	\$43.22	\$7.85	\$16.05	\$0.00	\$67.12
	06/01/2021	\$44.24	\$7.85	\$16.05	\$0.00	\$68.14
	12/01/2021	\$45.25	\$7.85	\$16.05	\$0.00	\$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER	06/01/2019	\$39.10	\$7.85	\$16.05	\$0.00	\$63.00
LABORERS - FOUNDATION AND MARINE	12/01/2019	\$40.10	\$7.85	\$16.05	\$0.00	\$64.00
	06/01/2020	\$41.09	\$7.85	\$16.05	\$0.00	\$64.99
	12/01/2020	\$42.07	\$7.85	\$16.05	\$0.00	\$65.97
	06/01/2021	\$43.09	\$7.85	\$16.05	\$0.00	\$66.99
	12/01/2021	\$44.10	\$7.85	\$16.05	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2019	\$39.10	\$7.85	\$16.05	\$0.00	\$63.00
	12/01/2019	\$40.10	\$7.85	\$16.05	\$0.00	\$64.00
	06/01/2020	\$41.09	\$7.85	\$16.05	\$0.00	\$64.99
	12/01/2020	\$42.07	\$7.85	\$16.05	\$0.00	\$65.97
	06/01/2021	\$43.09	\$7.85	\$16.05	\$0.00	\$66.99
	12/01/2021	\$44.10	\$7.85	\$16.05	\$0.00	\$68.00
	For apprentice rates see "Apprentice- LABORER"					
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
	For apprentice rates see "Apprentice- LABORER"					
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	09/01/2019	\$41.90	\$9.40	\$18.95	\$0.00	\$70.25
	03/01/2020	\$42.50	\$9.40	\$18.95	\$0.00	\$70.85
	09/01/2020	\$43.15	\$9.40	\$18.95	\$0.00	\$71.50
	03/01/2021	\$43.75	\$9.40	\$18.95	\$0.00	\$72.10
	09/01/2021	\$44.40	\$9.40	\$18.95	\$0.00	\$72.75
	03/01/2022	\$45.00	\$9.40	\$18.95	\$0.00	\$73.35
	09/01/2022	\$45.65	\$9.40	\$18.95	\$0.00	\$74.00
	03/01/2023	\$46.25	\$9.40	\$18.95	\$0.00	\$74.60

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - CARPENTER - Zone 2 Eastern MA
Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.95	\$9.40	\$1.73	\$0.00	\$32.08
2	60	\$25.14	\$9.40	\$1.73	\$0.00	\$36.27
3	70	\$29.33	\$9.40	\$13.76	\$0.00	\$52.49
4	75	\$31.43	\$9.40	\$13.76	\$0.00	\$54.59
5	80	\$33.52	\$9.40	\$15.49	\$0.00	\$58.41
6	80	\$33.52	\$9.40	\$15.49	\$0.00	\$58.41
7	90	\$37.71	\$9.40	\$17.22	\$0.00	\$64.33
8	90	\$37.71	\$9.40	\$17.22	\$0.00	\$64.33

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.25	\$9.40	\$1.73	\$0.00	\$32.38
2	60	\$25.50	\$9.40	\$1.73	\$0.00	\$36.63
3	70	\$29.75	\$9.40	\$13.76	\$0.00	\$52.91
4	75	\$31.88	\$9.40	\$13.76	\$0.00	\$55.04
5	80	\$34.00	\$9.40	\$15.49	\$0.00	\$58.89
6	80	\$34.00	\$9.40	\$15.49	\$0.00	\$58.89
7	90	\$38.25	\$9.40	\$17.22	\$0.00	\$64.87
8	90	\$38.25	\$9.40	\$17.22	\$0.00	\$64.87

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$29.99/ 3&4 \$35.85/ 5&6 \$54.22/ 7&8 \$60.14

Apprentice to Journeyworker Ratio:1:5
CARPENTER WOOD FRAME
CARPENTERS -ZONE 2 (Wood Frame)

10/01/2019

\$27.95

\$7.07

\$7.86

\$0.00

\$42.88

All Aspects of New Wood Frame Work

Apprentice - CARPENTER (Wood Frame) - Zone 2**Effective Date - 10/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.77	\$7.07	\$0.00	\$0.00	\$23.84
2	60	\$16.77	\$7.07	\$0.00	\$0.00	\$23.84
3	65	\$18.17	\$7.07	\$7.86	\$0.00	\$33.10
4	70	\$19.57	\$7.07	\$7.86	\$0.00	\$34.50
5	75	\$20.96	\$7.07	\$7.86	\$0.00	\$35.89
6	80	\$22.36	\$7.07	\$7.86	\$0.00	\$37.29
7	85	\$23.76	\$7.07	\$7.86	\$0.00	\$38.69
8	90	\$25.16	\$7.07	\$7.86	\$0.00	\$40.09

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
 Step 1&2 \$19.65/ 3&4 \$27.19/ 5&6 \$34.50/ 7&8 \$37.29

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING

07/01/2019

\$43.99

\$12.75

\$22.41

\$0.62

\$79.77

BRICKLAYERS LOCAL 3 (LOWELL)

01/01/2020

\$45.23

\$12.75

\$22.41

\$0.62

\$81.01

Apprentice - CEMENT MASONRY/PLASTERING - Lowell**Effective Date - 07/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.00	\$12.75	\$15.41	\$0.00	\$50.16
2	60	\$26.39	\$12.75	\$17.41	\$0.62	\$57.17
3	65	\$28.59	\$12.75	\$18.41	\$0.62	\$60.37
4	70	\$30.79	\$12.75	\$19.41	\$0.62	\$63.57
5	75	\$32.99	\$12.75	\$20.41	\$0.62	\$66.77
6	80	\$35.19	\$12.75	\$21.41	\$0.62	\$69.97
7	90	\$39.59	\$12.75	\$22.41	\$0.62	\$75.37

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.62	\$12.75	\$15.41	\$0.00	\$50.78
2	60	\$27.14	\$12.75	\$17.41	\$0.62	\$57.92
3	65	\$29.40	\$12.75	\$18.41	\$0.62	\$61.18
4	70	\$31.66	\$12.75	\$19.41	\$0.62	\$64.44
5	75	\$33.92	\$12.75	\$20.41	\$0.62	\$67.70
6	80	\$36.18	\$12.75	\$21.41	\$0.62	\$70.96
7	90	\$40.71	\$12.75	\$22.41	\$0.62	\$76.49

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$49.18	\$12.00	\$15.60	\$0.00	\$76.78
	12/01/2019	\$50.33	\$12.00	\$15.60	\$0.00	\$77.93
	06/01/2020	\$51.43	\$12.00	\$15.60	\$0.00	\$79.03
	12/01/2020	\$52.58	\$12.00	\$15.60	\$0.00	\$80.18
	06/01/2021	\$53.68	\$12.00	\$15.60	\$0.00	\$81.28
	12/01/2021	\$54.83	\$12.00	\$15.60	\$0.00	\$82.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$32.28	\$12.00	\$15.60	\$0.00	\$59.88
	12/01/2019	\$33.07	\$12.00	\$15.60	\$0.00	\$60.67
	06/01/2020	\$33.82	\$12.00	\$15.60	\$0.00	\$61.42
	12/01/2020	\$34.60	\$12.00	\$15.60	\$0.00	\$62.20
	06/01/2021	\$35.35	\$12.00	\$15.60	\$0.00	\$62.95
	12/01/2021	\$36.14	\$12.00	\$15.60	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	07/01/2019	\$50.66	\$8.20	\$21.45	\$0.00	\$80.31
	01/01/2020	\$50.96	\$8.20	\$22.10	\$0.00	\$81.26
	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

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - PAINTER Local 35 - BRIDGES/TANKS
Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.33	\$8.20	\$0.00	\$0.00	\$33.53
2	55	\$27.86	\$8.20	\$5.78	\$0.00	\$41.84
3	60	\$30.40	\$8.20	\$6.30	\$0.00	\$44.90
4	65	\$32.93	\$8.20	\$6.83	\$0.00	\$47.96
5	70	\$35.46	\$8.20	\$18.30	\$0.00	\$61.96
6	75	\$38.00	\$8.20	\$18.83	\$0.00	\$65.03
7	80	\$40.53	\$8.20	\$19.35	\$0.00	\$68.08
8	90	\$45.59	\$8.20	\$20.40	\$0.00	\$74.19

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental 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	\$18.51	\$0.00	\$62.38
6	75	\$38.22	\$8.20	\$19.05	\$0.00	\$65.47
7	80	\$40.77	\$8.20	\$19.59	\$0.00	\$68.56
8	90	\$45.86	\$8.20	\$20.67	\$0.00	\$74.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN LABORERS - ZONE 2	06/01/2019	\$39.30	\$7.85	\$15.85	\$0.00	\$63.00
	12/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS - ZONE 2	06/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
	12/01/2019	\$41.30	\$7.85	\$15.85	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS LABORERS - ZONE 2	06/01/2019	\$40.05	\$7.85	\$15.85	\$0.00	\$63.75
	12/01/2019	\$41.05	\$7.85	\$15.85	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE 2	06/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
	12/01/2019	\$41.30	\$7.85	\$15.85	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR LABORERS - ZONE 2	06/01/2019	\$40.05	\$7.85	\$15.85	\$0.00	\$63.75
	12/01/2019	\$41.05	\$7.85	\$15.85	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER LABORERS - ZONE 2	06/01/2019	\$39.30	\$7.85	\$15.85	\$0.00	\$63.00
	12/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$68.52	\$9.90	\$21.15	\$0.00	\$99.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$73.41	\$9.90	\$21.15	\$0.00	\$104.46
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>ELECTRICIANS LOCAL 103</i>	03/01/2019	\$51.10	\$13.00	\$18.88	\$0.00	\$82.98
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2019	\$51.10	\$13.00	\$18.88	\$0.00	\$82.98

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$20.44	\$13.00	\$0.61	\$0.00	\$34.05
2	40	\$20.44	\$13.00	\$0.61	\$0.00	\$34.05
3	45	\$23.00	\$13.00	\$14.34	\$0.00	\$50.34
4	45	\$23.00	\$13.00	\$14.34	\$0.00	\$50.34
5	50	\$25.55	\$13.00	\$14.76	\$0.00	\$53.31
6	55	\$28.11	\$13.00	\$15.17	\$0.00	\$56.28
7	60	\$30.66	\$13.00	\$15.58	\$0.00	\$59.24
8	65	\$33.22	\$13.00	\$16.00	\$0.00	\$62.22
9	70	\$35.77	\$13.00	\$16.40	\$0.00	\$65.17
10	75	\$38.33	\$13.00	\$16.82	\$0.00	\$68.15

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2019	\$59.47	\$15.58	\$17.51	\$0.00	\$92.56
	01/01/2020	\$61.42	\$15.73	\$18.41	\$0.00	\$95.56
	01/01/2021	\$63.47	\$15.88	\$19.31	\$0.00	\$98.66
	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$29.74	\$15.58	\$0.00	\$0.00	\$45.32
2	55	\$32.71	\$15.58	\$17.51	\$0.00	\$65.80
3	65	\$38.66	\$15.58	\$17.51	\$0.00	\$71.75
4	70	\$41.63	\$15.58	\$17.51	\$0.00	\$74.72
5	80	\$47.58	\$15.58	\$17.51	\$0.00	\$80.67

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.71	\$15.73	\$0.00	\$0.00	\$46.44
2	55	\$33.78	\$15.73	\$18.41	\$0.00	\$67.92
3	65	\$39.92	\$15.73	\$18.41	\$0.00	\$74.06
4	70	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
5	80	\$49.14	\$15.73	\$18.41	\$0.00	\$83.28

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER	01/01/2019	\$41.63	\$15.58	\$17.51	\$0.00	\$74.72
ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2020	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
	01/01/2021	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	11/01/2019	\$44.18	\$12.00	\$15.60	\$0.00	\$71.78
OPERATING ENGINEERS LOCAL 4	05/01/2020	\$45.33	\$12.00	\$15.60	\$0.00	\$72.93
	11/01/2020	\$46.33	\$12.00	\$15.60	\$0.00	\$73.93
	05/01/2021	\$47.48	\$12.00	\$15.60	\$0.00	\$75.08
	11/01/2021	\$48.48	\$12.00	\$15.60	\$0.00	\$76.08
	05/01/2022	\$49.63	\$12.00	\$15.60	\$0.00	\$77.23

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2019	\$45.68	\$12.00	\$15.60	\$0.00	\$73.28
	05/01/2020	\$46.83	\$12.00	\$15.60	\$0.00	\$74.43
	11/01/2020	\$47.84	\$12.00	\$15.60	\$0.00	\$75.44
	05/01/2021	\$49.00	\$12.00	\$15.60	\$0.00	\$76.60
	11/01/2021	\$50.01	\$12.00	\$15.60	\$0.00	\$77.61
	05/01/2022	\$51.17	\$12.00	\$15.60	\$0.00	\$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2019	\$22.57	\$12.00	\$15.60	\$0.00	\$50.17
	05/01/2020	\$23.24	\$12.00	\$15.60	\$0.00	\$50.84
	11/01/2020	\$23.83	\$12.00	\$15.60	\$0.00	\$51.43
	05/01/2021	\$24.51	\$12.00	\$15.60	\$0.00	\$52.11
	11/01/2021	\$25.11	\$12.00	\$15.60	\$0.00	\$52.71
	05/01/2022	\$25.78	\$12.00	\$15.60	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2019	\$51.10	\$13.00	\$18.88	\$0.00	\$82.98
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS LOCAL 103</i>	03/01/2019	\$38.33	\$13.00	\$16.82	\$0.00	\$68.15
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$39.54	\$12.00	\$15.60	\$0.00	\$67.14
	12/01/2019	\$40.49	\$12.00	\$15.60	\$0.00	\$68.09
	06/01/2020	\$41.40	\$12.00	\$15.60	\$0.00	\$69.00
	12/01/2020	\$42.35	\$12.00	\$15.60	\$0.00	\$69.95
	06/01/2021	\$43.26	\$12.00	\$15.60	\$0.00	\$70.86
	12/01/2021	\$44.21	\$12.00	\$15.60	\$0.00	\$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER <i>LABORERS - ZONE 2</i>	06/01/2019	\$22.50	\$7.85	\$14.88	\$0.00	\$45.23
	12/01/2019	\$23.50	\$7.85	\$14.88	\$0.00	\$46.23
	06/01/2020	\$23.50	\$7.85	\$14.88	\$0.00	\$46.23
	12/01/2020	\$24.50	\$7.85	\$14.88	\$0.00	\$47.23
	06/01/2021	\$24.50	\$7.85	\$14.88	\$0.00	\$47.23
	12/01/2021	\$24.50	\$7.85	\$14.88	\$0.00	\$47.23
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE I</i>	09/01/2019	\$46.25	\$9.40	\$19.25	\$0.00	\$74.90
	03/01/2020	\$47.05	\$9.40	\$19.25	\$0.00	\$75.70
	09/01/2020	\$47.85	\$9.40	\$19.25	\$0.00	\$76.50
	03/01/2021	\$48.65	\$9.40	\$19.25	\$0.00	\$77.30
	09/01/2021	\$49.45	\$9.40	\$19.25	\$0.00	\$78.10
	03/01/2022	\$50.25	\$9.40	\$19.25	\$0.00	\$78.90

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.13	\$9.40	\$1.79	\$0.00	\$34.32
2	55	\$25.44	\$9.40	\$1.79	\$0.00	\$36.63
3	60	\$27.75	\$9.40	\$13.88	\$0.00	\$51.03
4	65	\$30.06	\$9.40	\$13.88	\$0.00	\$53.34
5	70	\$32.38	\$9.40	\$15.67	\$0.00	\$57.45
6	75	\$34.69	\$9.40	\$15.67	\$0.00	\$59.76
7	80	\$37.00	\$9.40	\$17.46	\$0.00	\$63.86
8	85	\$39.31	\$9.40	\$17.46	\$0.00	\$66.17

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.53	\$9.40	\$1.79	\$0.00	\$34.72
2	55	\$25.88	\$9.40	\$1.79	\$0.00	\$37.07
3	60	\$28.23	\$9.40	\$13.88	\$0.00	\$51.51
4	65	\$30.58	\$9.40	\$13.88	\$0.00	\$53.86
5	70	\$32.94	\$9.40	\$15.67	\$0.00	\$58.01
6	75	\$35.29	\$9.40	\$15.67	\$0.00	\$60.36
7	80	\$37.64	\$9.40	\$17.46	\$0.00	\$64.50
8	85	\$39.99	\$9.40	\$17.46	\$0.00	\$66.85

Notes: Steps are 750 hrs.

% After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)

Step 1&2 \$32.00/ 3&4 \$38.36/ 5&6 \$57.45/ 7&8 \$63.86

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$32.28	\$12.00	\$15.60	\$0.00	\$59.88
	12/01/2019	\$33.07	\$12.00	\$15.60	\$0.00	\$60.67
	06/01/2020	\$33.82	\$12.00	\$15.60	\$0.00	\$61.42
	12/01/2020	\$34.60	\$12.00	\$15.60	\$0.00	\$62.20
	06/01/2021	\$35.35	\$12.00	\$15.60	\$0.00	\$62.95
	12/01/2021	\$36.14	\$12.00	\$15.60	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 2)</i>	07/01/2019	\$40.16	\$8.20	\$21.45	\$0.00	\$69.81
	01/01/2020	\$40.46	\$8.20	\$22.10	\$0.00	\$70.76
	07/01/2020	\$41.56	\$8.20	\$22.10	\$0.00	\$71.86
	01/01/2021	\$42.66	\$8.20	\$22.10	\$0.00	\$72.96

Classification

Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate

Apprentice - GLAZIER - Local 35 Zone 2
Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.08	\$8.20	\$0.00	\$0.00	\$28.28
2	55	\$22.09	\$8.20	\$5.78	\$0.00	\$36.07
3	60	\$24.10	\$8.20	\$6.30	\$0.00	\$38.60
4	65	\$26.10	\$8.20	\$6.83	\$0.00	\$41.13
5	70	\$28.11	\$8.20	\$18.30	\$0.00	\$54.61
6	75	\$30.12	\$8.20	\$18.83	\$0.00	\$57.15
7	80	\$32.13	\$8.20	\$19.35	\$0.00	\$59.68
8	90	\$36.14	\$8.20	\$20.40	\$0.00	\$64.74

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.23	\$8.20	\$0.00	\$0.00	\$28.43
2	55	\$22.25	\$8.20	\$5.94	\$0.00	\$36.39
3	60	\$24.28	\$8.20	\$6.48	\$0.00	\$38.96
4	65	\$26.30	\$8.20	\$7.02	\$0.00	\$41.52
5	70	\$28.32	\$8.20	\$18.51	\$0.00	\$55.03
6	75	\$30.35	\$8.20	\$19.05	\$0.00	\$57.60
7	80	\$32.37	\$8.20	\$19.59	\$0.00	\$60.16
8	90	\$36.41	\$8.20	\$20.67	\$0.00	\$65.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1
HOISTING ENGINEER/CRANES/GRADALLS
OPERATING ENGINEERS LOCAL 4

06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - OPERATING ENGINEERS - Local 4
Effective Date - 06/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$26.50	\$12.00	\$0.00	\$0.00	\$38.50
2	60	\$28.91	\$12.00	\$15.60	\$0.00	\$56.51
3	65	\$31.32	\$12.00	\$15.60	\$0.00	\$58.92
4	70	\$33.73	\$12.00	\$15.60	\$0.00	\$61.33
5	75	\$36.14	\$12.00	\$15.60	\$0.00	\$63.74
6	80	\$38.54	\$12.00	\$15.60	\$0.00	\$66.14
7	85	\$40.95	\$12.00	\$15.60	\$0.00	\$68.55
8	90	\$43.36	\$12.00	\$15.60	\$0.00	\$70.96

Effective Date - 12/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$27.13	\$12.00	\$0.00	\$0.00	\$39.13
2	60	\$29.60	\$12.00	\$15.60	\$0.00	\$57.20
3	65	\$32.06	\$12.00	\$15.60	\$0.00	\$59.66
4	70	\$34.53	\$12.00	\$15.60	\$0.00	\$62.13
5	75	\$37.00	\$12.00	\$15.60	\$0.00	\$64.60
6	80	\$39.46	\$12.00	\$15.60	\$0.00	\$67.06
7	85	\$41.93	\$12.00	\$15.60	\$0.00	\$69.53
8	90	\$44.40	\$12.00	\$15.60	\$0.00	\$72.00

Notes:
Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	08/01/2019	\$48.10	\$13.20	\$24.12	\$2.56	\$87.98
	02/01/2020	\$49.75	\$13.20	\$24.12	\$2.61	\$89.68
	08/01/2020	\$51.35	\$13.20	\$24.12	\$2.66	\$91.33
	02/01/2021	\$53.00	\$13.20	\$24.12	\$2.71	\$93.03
	08/01/2021	\$54.75	\$13.20	\$24.12	\$2.76	\$94.83
	02/01/2022	\$56.50	\$13.20	\$24.12	\$2.81	\$96.63
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	03/01/2019	\$51.10	\$13.00	\$18.88	\$0.00	\$82.98
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 - A	08/01/2019	\$48.10	\$13.20	\$24.12	\$2.56	\$87.98
	02/01/2020	\$49.75	\$13.20	\$24.12	\$2.61	\$89.68
	08/01/2020	\$51.35	\$13.20	\$24.12	\$2.66	\$91.33
	02/01/2021	\$53.00	\$13.20	\$24.12	\$2.71	\$93.03
	08/01/2021	\$54.75	\$13.20	\$24.12	\$2.76	\$94.83
	02/01/2022	\$56.50	\$13.20	\$24.12	\$2.81	\$96.63
For apprentice rates see "Apprentice- SHEET METAL WORKER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	09/01/2019	\$54.69	\$10.95	\$19.74	\$0.00	\$85.38
	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.19	\$10.95	\$19.74	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	09/01/2019	\$54.69	\$10.95	\$19.74	\$0.00	\$85.38
	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.19	\$10.95	\$19.74	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.70	\$7.85	\$14.88	\$0.00	\$57.43
	12/01/2019	\$35.56	\$7.85	\$14.88	\$0.00	\$58.29
	06/01/2020	\$36.45	\$7.85	\$14.88	\$0.00	\$59.18
	12/01/2020	\$37.34	\$7.85	\$14.88	\$0.00	\$60.07
	06/01/2021	\$38.26	\$7.85	\$14.88	\$0.00	\$60.99
	12/01/2021	\$39.17	\$7.85	\$14.88	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2019	\$48.44	\$12.80	\$16.40	\$0.00	\$77.64

Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.22	\$12.80	\$11.90	\$0.00	\$48.92
2	60	\$29.06	\$12.80	\$12.80	\$0.00	\$54.66
3	70	\$33.91	\$12.80	\$13.70	\$0.00	\$60.41
4	80	\$38.75	\$12.80	\$14.60	\$0.00	\$66.15

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (LAWRENCE AREA)</i>	03/16/2019	\$42.25	\$8.00	\$23.50	\$0.00	\$73.75
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Apprentice - IRONWORKER - Local 7 Lawrence

Effective Date - 03/16/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$25.35	\$8.00	\$23.50	\$0.00	\$56.85
2	70	\$29.58	\$8.00	\$23.50	\$0.00	\$61.08
3	75	\$31.69	\$8.00	\$23.35	\$0.00	\$63.04
4	80	\$33.80	\$8.00	\$23.50	\$0.00	\$65.30
5	85	\$35.91	\$8.00	\$23.50	\$0.00	\$67.41
6	90	\$38.03	\$8.00	\$23.50	\$0.00	\$69.53

Notes:

Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

LABORER	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
LABORERS - ZONE 2	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - LABORER - Zone 2

Effective Date - 06/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.37	\$7.85	\$14.88	\$0.00	\$43.10
2	70	\$23.77	\$7.85	\$14.88	\$0.00	\$46.50
3	80	\$27.16	\$7.85	\$14.88	\$0.00	\$49.89
4	90	\$30.56	\$7.85	\$14.88	\$0.00	\$53.29

Effective Date - 12/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.89	\$7.85	\$14.88	\$0.00	\$43.62
2	70	\$24.37	\$7.85	\$14.88	\$0.00	\$47.10
3	80	\$27.85	\$7.85	\$14.88	\$0.00	\$50.58
4	90	\$31.33	\$7.85	\$14.88	\$0.00	\$54.06

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER LABORERS - ZONE 2	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER LABORERS - ZONE 2	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS - ZONE 2	06/01/2019	\$34.15	\$7.85	\$14.83	\$0.00	\$56.83
	12/01/2019	\$35.01	\$7.85	\$14.83	\$0.00	\$57.69
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER LABORERS - ZONE 2	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 2</i>	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
	For apprentice rates see "Apprentice- LABORER"					
LABORER: TREE REMOVER <i>LABORERS - ZONE 2</i>	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
	This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"					
LASER BEAM OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
	For apprentice rates see "Apprentice- LABORER"					
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2019	\$41.49	\$10.75	\$19.61	\$0.00	\$71.85
	02/01/2020	\$42.00	\$10.75	\$19.61	\$0.00	\$72.36
	08/01/2020	\$43.08	\$10.75	\$19.76	\$0.00	\$73.59
	02/01/2021	\$43.59	\$10.75	\$19.76	\$0.00	\$74.10
	08/01/2021	\$44.71	\$10.75	\$19.92	\$0.00	\$75.38
	02/01/2022	\$45.18	\$10.75	\$19.92	\$0.00	\$75.85

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**Effective Date -** 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.75	\$10.75	\$19.61	\$0.00	\$51.11
2	60	\$24.89	\$10.75	\$19.61	\$0.00	\$55.25
3	70	\$29.04	\$10.75	\$19.61	\$0.00	\$59.40
4	80	\$33.19	\$10.75	\$19.61	\$0.00	\$63.55
5	90	\$37.34	\$10.75	\$19.61	\$0.00	\$67.70

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.00	\$10.75	\$19.61	\$0.00	\$51.36
2	60	\$25.20	\$10.75	\$19.61	\$0.00	\$55.56
3	70	\$29.40	\$10.75	\$19.61	\$0.00	\$59.76
4	80	\$33.60	\$10.75	\$19.61	\$0.00	\$63.96
5	90	\$37.80	\$10.75	\$19.61	\$0.00	\$68.16

Notes:**Apprentice to Journeyworker Ratio:1:3**MARBLE MASONS, TILELAYERS & TERRAZZO MECH
BRICKLAYERS LOCAL 3 - MARBLE & TILE

08/01/2019	\$54.42	\$10.75	\$21.30	\$0.00	\$86.47
02/01/2020	\$55.05	\$10.75	\$21.30	\$0.00	\$87.10
08/01/2020	\$56.40	\$10.75	\$21.45	\$0.00	\$88.60
02/01/2021	\$57.04	\$10.75	\$21.45	\$0.00	\$89.24
08/01/2021	\$58.44	\$10.75	\$21.61	\$0.00	\$90.80
02/01/2022	\$59.01	\$10.75	\$21.61	\$0.00	\$91.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental 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

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.53	\$10.75	\$21.30	\$0.00	\$59.58
2	60	\$33.03	\$10.75	\$21.30	\$0.00	\$65.08
3	70	\$38.54	\$10.75	\$21.30	\$0.00	\$70.59
4	80	\$44.04	\$10.75	\$21.30	\$0.00	\$76.09
5	90	\$49.55	\$10.75	\$21.30	\$0.00	\$81.60

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES)	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2)	04/01/2019	\$38.87	\$9.90	\$18.50	\$0.00	\$67.27
MILLWRIGHTS LOCAL 1121 - Zone 2						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - MILLWRIGHT - Local 1121 Zone 2						
Effective Date - 04/01/2019						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$21.38	\$9.90	\$5.31	\$0.00	\$36.59
2	65	\$25.27	\$9.90	\$15.13	\$0.00	\$50.30
3	75	\$29.15	\$9.90	\$16.10	\$0.00	\$55.15
4	85	\$33.04	\$9.90	\$17.06	\$0.00	\$60.00
Notes:						
Steps are 2,000 hours						
Apprentice to Journeyworker Ratio:1:5						
MORTAR MIXER	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS)	06/01/2019	\$23.11	\$12.00	\$15.60	\$0.00	\$50.71
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$23.68	\$12.00	\$15.60	\$0.00	\$51.28
	06/01/2020	\$24.23	\$12.00	\$15.60	\$0.00	\$51.83
	12/01/2020	\$24.80	\$12.00	\$15.60	\$0.00	\$52.40
	06/01/2021	\$25.35	\$12.00	\$15.60	\$0.00	\$52.95
	12/01/2021	\$25.93	\$12.00	\$15.60	\$0.00	\$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS)	06/01/2019	\$27.57	\$12.00	\$15.60	\$0.00	\$55.17
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$28.24	\$12.00	\$15.60	\$0.00	\$55.84
	06/01/2020	\$28.89	\$12.00	\$15.60	\$0.00	\$56.49
	12/01/2020	\$29.57	\$12.00	\$15.60	\$0.00	\$57.17
	06/01/2021	\$30.21	\$12.00	\$15.60	\$0.00	\$57.81
	12/01/2021	\$30.89	\$12.00	\$15.60	\$0.00	\$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS)	07/01/2019	\$50.66	\$8.20	\$21.45	\$0.00	\$80.31
PAINTERS LOCAL 35 - ZONE 2	01/01/2020	\$50.96	\$8.20	\$22.10	\$0.00	\$81.26
	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

Classification

**Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate**

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.33	\$8.20	\$0.00	\$0.00	\$33.53
2	55	\$27.86	\$8.20	\$5.78	\$0.00	\$41.84
3	60	\$30.40	\$8.20	\$6.30	\$0.00	\$44.90
4	65	\$32.93	\$8.20	\$6.83	\$0.00	\$47.96
5	70	\$35.46	\$8.20	\$18.30	\$0.00	\$61.96
6	75	\$38.00	\$8.20	\$18.83	\$0.00	\$65.03
7	80	\$40.53	\$8.20	\$19.35	\$0.00	\$68.08
8	90	\$45.59	\$8.20	\$20.40	\$0.00	\$74.19

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental 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	\$18.51	\$0.00	\$62.38
6	75	\$38.22	\$8.20	\$19.05	\$0.00	\$65.47
7	80	\$40.77	\$8.20	\$19.59	\$0.00	\$68.56
8	90	\$45.86	\$8.20	\$20.67	\$0.00	\$74.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SIGN, PICTORIAL & DISPLAY)	06/01/2013	\$25.81	\$7.07	\$7.05	\$0.00	\$39.93
PAINTERS LOCAL 35 - ZONE 2						

Apprentice - PAINTER SIGN - Local 35 Zone 2**Effective Date - 06/01/2013**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental 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.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *

07/01/2019 \$41.56 \$8.20 \$21.45 \$0.00 \$71.21

* If 30% or more of surfaces to be painted are new construction,

01/01/2020 \$41.86 \$8.20 \$22.10 \$0.00 \$72.16

NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2

07/01/2020 \$42.96 \$8.20 \$22.10 \$0.00 \$73.26

01/01/2021 \$44.06 \$8.20 \$22.10 \$0.00 \$74.36

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New
Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.78	\$8.20	\$0.00	\$0.00	\$28.98
2	55	\$22.86	\$8.20	\$5.78	\$0.00	\$36.84
3	60	\$24.94	\$8.20	\$6.30	\$0.00	\$39.44
4	65	\$27.01	\$8.20	\$6.83	\$0.00	\$42.04
5	70	\$29.09	\$8.20	\$18.30	\$0.00	\$55.59
6	75	\$31.17	\$8.20	\$18.83	\$0.00	\$58.20
7	80	\$33.25	\$8.20	\$19.35	\$0.00	\$60.80
8	90	\$37.40	\$8.20	\$20.40	\$0.00	\$66.00

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.93	\$8.20	\$0.00	\$0.00	\$29.13
2	55	\$23.02	\$8.20	\$5.94	\$0.00	\$37.16
3	60	\$25.12	\$8.20	\$6.48	\$0.00	\$39.80
4	65	\$27.21	\$8.20	\$7.02	\$0.00	\$42.43
5	70	\$29.30	\$8.20	\$18.51	\$0.00	\$56.01
6	75	\$31.40	\$8.20	\$19.05	\$0.00	\$58.65
7	80	\$33.49	\$8.20	\$19.59	\$0.00	\$61.28
8	90	\$37.67	\$8.20	\$20.67	\$0.00	\$66.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2019	\$39.62	\$8.20	\$21.45	\$0.00	\$69.27
PAINTERS LOCAL 35 - ZONE 2	01/01/2020	\$39.92	\$8.20	\$22.10	\$0.00	\$70.22
	07/01/2020	\$41.02	\$8.20	\$22.10	\$0.00	\$71.32
	01/01/2021	\$42.12	\$8.20	\$22.10	\$0.00	\$72.42

Classification

**Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate**

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint
Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.81	\$8.20	\$0.00	\$0.00	\$28.01
2	55	\$21.79	\$8.20	\$5.78	\$0.00	\$35.77
3	60	\$23.77	\$8.20	\$6.30	\$0.00	\$38.27
4	65	\$25.75	\$8.20	\$6.83	\$0.00	\$40.78
5	70	\$27.73	\$8.20	\$18.30	\$0.00	\$54.23
6	75	\$29.72	\$8.20	\$18.83	\$0.00	\$56.75
7	80	\$31.70	\$8.20	\$19.35	\$0.00	\$59.25
8	90	\$35.66	\$8.20	\$20.40	\$0.00	\$64.26

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.96	\$8.20	\$0.00	\$0.00	\$28.16
2	55	\$21.96	\$8.20	\$5.94	\$0.00	\$36.10
3	60	\$23.95	\$8.20	\$6.48	\$0.00	\$38.63
4	65	\$25.95	\$8.20	\$7.02	\$0.00	\$41.17
5	70	\$27.94	\$8.20	\$18.51	\$0.00	\$54.65
6	75	\$29.94	\$8.20	\$19.05	\$0.00	\$57.19
7	80	\$31.94	\$8.20	\$19.59	\$0.00	\$59.73
8	90	\$35.93	\$8.20	\$20.67	\$0.00	\$64.80

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS)	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
LABORERS - ZONE 2	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) *	07/01/2019	\$40.16	\$8.20	\$21.45	\$0.00	\$69.81
* If 30% or more of surfaces to be painted are new construction,	01/01/2020	\$40.46	\$8.20	\$22.10	\$0.00	\$70.76
NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	07/01/2020	\$41.56	\$8.20	\$22.10	\$0.00	\$71.86
	01/01/2021	\$42.66	\$8.20	\$22.10	\$0.00	\$72.96

Classification

**Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate**

Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.08	\$8.20	\$0.00	\$0.00	\$28.28
2	55	\$22.09	\$8.20	\$5.78	\$0.00	\$36.07
3	60	\$24.10	\$8.20	\$6.30	\$0.00	\$38.60
4	65	\$26.10	\$8.20	\$6.83	\$0.00	\$41.13
5	70	\$28.11	\$8.20	\$18.30	\$0.00	\$54.61
6	75	\$30.12	\$8.20	\$18.83	\$0.00	\$57.15
7	80	\$32.13	\$8.20	\$19.35	\$0.00	\$59.68
8	90	\$36.14	\$8.20	\$20.40	\$0.00	\$64.74

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.23	\$8.20	\$0.00	\$0.00	\$28.43
2	55	\$22.25	\$8.20	\$5.94	\$0.00	\$36.39
3	60	\$24.28	\$8.20	\$6.48	\$0.00	\$38.96
4	65	\$26.30	\$8.20	\$7.02	\$0.00	\$41.52
5	70	\$28.32	\$8.20	\$18.51	\$0.00	\$55.03
6	75	\$30.35	\$8.20	\$19.05	\$0.00	\$57.60
7	80	\$32.37	\$8.20	\$19.59	\$0.00	\$60.16
8	90	\$36.41	\$8.20	\$20.67	\$0.00	\$65.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	07/01/2019	\$38.22	\$8.20	\$21.45	\$0.00	\$67.87
PAINTERS LOCAL 35 - ZONE 2	01/01/2020	\$38.52	\$8.20	\$22.10	\$0.00	\$68.82
	07/01/2020	\$39.62	\$8.20	\$22.10	\$0.00	\$69.92
	01/01/2021	\$40.72	\$8.20	\$22.10	\$0.00	\$71.02

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT
Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.11	\$8.20	\$0.00	\$0.00	\$27.31
2	55	\$21.02	\$8.20	\$5.78	\$0.00	\$35.00
3	60	\$22.93	\$8.20	\$6.30	\$0.00	\$37.43
4	65	\$24.84	\$8.20	\$6.83	\$0.00	\$39.87
5	70	\$26.75	\$8.20	\$18.30	\$0.00	\$53.25
6	75	\$28.67	\$8.20	\$18.83	\$0.00	\$55.70
7	80	\$30.58	\$8.20	\$19.35	\$0.00	\$58.13
8	90	\$34.40	\$8.20	\$20.40	\$0.00	\$63.00

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.26	\$8.20	\$0.00	\$0.00	\$27.46
2	55	\$21.19	\$8.20	\$5.94	\$0.00	\$35.33
3	60	\$23.11	\$8.20	\$6.48	\$0.00	\$37.79
4	65	\$25.04	\$8.20	\$7.02	\$0.00	\$40.26
5	70	\$26.96	\$8.20	\$18.51	\$0.00	\$53.67
6	75	\$28.89	\$8.20	\$19.05	\$0.00	\$56.14
7	80	\$30.82	\$8.20	\$19.59	\$0.00	\$58.61
8	90	\$34.67	\$8.20	\$20.67	\$0.00	\$63.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1
PANEL & PICKUP TRUCKS DRIVER
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

08/01/2019	\$34.08	\$12.41	\$12.70	\$0.00	\$59.19
12/01/2019	\$34.08	\$12.41	\$13.72	\$0.00	\$60.21
06/01/2020	\$34.98	\$12.41	\$13.72	\$0.00	\$61.11
08/01/2020	\$34.98	\$12.91	\$13.72	\$0.00	\$61.61
12/01/2020	\$34.98	\$12.91	\$14.82	\$0.00	\$62.71
06/01/2021	\$35.78	\$12.91	\$14.82	\$0.00	\$63.51
08/01/2021	\$35.78	\$13.41	\$14.82	\$0.00	\$64.01
12/01/2021	\$35.78	\$13.41	\$16.01	\$0.00	\$65.20

PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)
PILE DRIVER LOCAL 56 (ZONE 1)

For apprentice rates see "Apprentice- PILE DRIVER"

08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
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PILE DRIVER
PILE DRIVER LOCAL 56 (ZONE 1)

08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
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Apprentice - PILE DRIVER - Local 56 Zone 1**Effective Date - 08/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.47	\$9.90	\$21.15	\$0.00	\$55.52
2	60	\$29.36	\$9.90	\$21.15	\$0.00	\$60.41
3	70	\$34.26	\$9.90	\$21.15	\$0.00	\$65.31
4	75	\$36.71	\$9.90	\$21.15	\$0.00	\$67.76
5	80	\$39.15	\$9.90	\$21.15	\$0.00	\$70.20
6	80	\$39.15	\$9.90	\$21.15	\$0.00	\$70.20
7	90	\$44.05	\$9.90	\$21.15	\$0.00	\$75.10
8	90	\$44.05	\$9.90	\$21.15	\$0.00	\$75.10

Notes:**Apprentice to Journeyworker Ratio:1:5****PIPEFITTER & STEAMFITTER***PIPEFITTERS LOCAL 537*

09/01/2019	\$54.69	\$10.95	\$19.74	\$0.00	\$85.38
03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
03/01/2021	\$59.19	\$10.95	\$19.74	\$0.00	\$89.88

Apprentice - PIPEFITTER - Local 537**Effective Date - 09/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.88	\$10.95	\$8.00	\$0.00	\$40.83
2	45	\$24.61	\$10.95	\$19.74	\$0.00	\$55.30
3	60	\$32.81	\$10.95	\$19.74	\$0.00	\$63.50
4	70	\$38.28	\$10.95	\$19.74	\$0.00	\$68.97
5	80	\$43.75	\$10.95	\$19.74	\$0.00	\$74.44

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$22.48	\$10.95	\$8.00	\$0.00	\$41.43
2	45	\$25.29	\$10.95	\$19.74	\$0.00	\$55.98
3	60	\$33.71	\$10.95	\$19.74	\$0.00	\$64.40
4	70	\$39.33	\$10.95	\$19.74	\$0.00	\$70.02
5	80	\$44.95	\$10.95	\$19.74	\$0.00	\$75.64

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.

Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

PLUMBERS & GASFITTERS <i>PLUMBERS & GASFITTERS LOCAL 12</i>	09/01/2019	\$57.69	\$11.82	\$17.01	\$0.00	\$86.52
	03/01/2020	\$59.19	\$11.82	\$17.01	\$0.00	\$88.02
	09/01/2020	\$60.69	\$11.82	\$17.01	\$0.00	\$89.52
	03/01/2021	\$62.19	\$11.82	\$17.01	\$0.00	\$91.02

Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$20.19	\$11.82	\$6.16	\$0.00	\$38.17
2	40	\$23.08	\$11.82	\$6.99	\$0.00	\$41.89
3	55	\$31.73	\$11.82	\$9.53	\$0.00	\$53.08
4	65	\$37.50	\$11.82	\$11.18	\$0.00	\$60.50
5	75	\$43.27	\$11.82	\$12.88	\$0.00	\$67.97

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$20.72	\$11.82	\$6.16	\$0.00	\$38.70
2	40	\$23.68	\$11.82	\$6.99	\$0.00	\$42.49
3	55	\$32.55	\$11.82	\$9.53	\$0.00	\$53.90
4	65	\$38.47	\$11.82	\$11.18	\$0.00	\$61.47
5	75	\$44.39	\$11.82	\$12.88	\$0.00	\$69.09

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic\$64.20, Step5 with lic\$71.67

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	09/01/2019	\$54.69	\$10.95	\$19.74	\$0.00	\$85.38
	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.17	\$10.95	\$19.74	\$0.00	\$89.86

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.95	\$7.85	\$14.88	\$0.00	\$57.68
	12/01/2019	\$35.81	\$7.85	\$14.88	\$0.00	\$58.54
	06/01/2020	\$36.70	\$7.85	\$14.88	\$0.00	\$59.43
	12/01/2020	\$37.59	\$7.85	\$14.88	\$0.00	\$60.32
	06/01/2021	\$38.51	\$7.85	\$14.88	\$0.00	\$61.24
	12/01/2021	\$39.42	\$7.85	\$14.88	\$0.00	\$62.15
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$32.28	\$12.00	\$15.60	\$0.00	\$59.88
	12/01/2019	\$33.07	\$12.00	\$15.60	\$0.00	\$60.67
	06/01/2020	\$33.82	\$12.00	\$15.60	\$0.00	\$61.42
	12/01/2020	\$34.60	\$12.00	\$15.60	\$0.00	\$62.20
	06/01/2021	\$35.35	\$12.00	\$15.60	\$0.00	\$62.95
	12/01/2021	\$36.14	\$12.00	\$15.60	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 170 - J.G. MacLellan (Lowell)</i>	05/01/2019	\$24.80	\$9.29	\$6.35	\$0.00	\$40.44
	01/01/2020	\$24.80	\$9.65	\$6.35	\$0.00	\$40.80
	05/01/2020	\$25.15	\$9.65	\$6.35	\$0.00	\$41.15
	01/01/2021	\$25.15	\$10.01	\$6.35	\$0.00	\$41.51
	05/01/2021	\$25.50	\$10.01	\$6.35	\$0.00	\$41.86
	01/01/2022	\$25.50	\$10.37	\$6.35	\$0.00	\$42.22
	05/01/2022	\$25.85	\$10.37	\$6.35	\$0.00	\$42.57
	01/01/2023	\$25.85	\$10.77	\$6.35	\$0.00	\$42.97
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg) <i>ROOFERS LOCAL 33</i>	08/01/2019	\$44.64	\$11.50	\$15.90	\$0.00	\$72.04
	02/01/2020	\$45.92	\$11.50	\$15.90	\$0.00	\$73.32
	08/01/2020	\$47.35	\$11.50	\$15.90	\$0.00	\$74.75
	02/01/2021	\$48.78	\$11.50	\$15.90	\$0.00	\$76.18
	08/01/2021	\$50.21	\$11.50	\$15.90	\$0.00	\$77.61
	02/01/2022	\$51.64	\$11.50	\$15.90	\$0.00	\$79.04

Apprentice - ROOFER - Local 33

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.32	\$11.50	\$3.69	\$0.00	\$37.51
2	60	\$26.78	\$11.50	\$15.90	\$0.00	\$54.18
3	65	\$29.02	\$11.50	\$15.90	\$0.00	\$56.42
4	75	\$33.48	\$11.50	\$15.90	\$0.00	\$60.88
5	85	\$37.94	\$11.50	\$15.90	\$0.00	\$65.34

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.96	\$11.50	\$3.69	\$0.00	\$38.15
2	60	\$27.55	\$11.50	\$15.90	\$0.00	\$54.95
3	65	\$29.85	\$11.50	\$15.90	\$0.00	\$57.25
4	75	\$34.44	\$11.50	\$15.90	\$0.00	\$61.84
5	85	\$39.03	\$11.50	\$15.90	\$0.00	\$66.43

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROOFER SLATE / TILE / PRECAST CONCRETE <i>ROOFERS LOCAL 33</i>	08/01/2019	\$44.89	\$11.50	\$15.90	\$0.00	\$72.29
	02/01/2020	\$46.17	\$11.50	\$15.90	\$0.00	\$73.57
	08/01/2020	\$47.60	\$11.50	\$15.90	\$0.00	\$75.00
	02/01/2021	\$49.03	\$11.50	\$15.90	\$0.00	\$76.43
	08/01/2021	\$50.46	\$11.50	\$15.90	\$0.00	\$77.86
	02/01/2022	\$51.89	\$11.50	\$15.90	\$0.00	\$79.29
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	08/01/2019	\$48.10	\$13.20	\$24.12	\$2.56	\$87.98
	02/01/2020	\$49.75	\$13.20	\$24.12	\$2.61	\$89.68
	08/01/2020	\$51.35	\$13.20	\$24.12	\$2.66	\$91.33
	02/01/2021	\$53.00	\$13.20	\$24.12	\$2.71	\$93.03
	08/01/2021	\$54.75	\$13.20	\$24.12	\$2.76	\$94.83
	02/01/2022	\$56.50	\$13.20	\$24.12	\$2.81	\$96.63

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$20.20	\$13.20	\$5.89	\$0.00	\$39.29
2	42	\$20.20	\$13.20	\$5.89	\$0.00	\$39.29
3	47	\$22.61	\$13.20	\$11.13	\$1.41	\$48.35
4	47	\$22.61	\$13.20	\$11.13	\$1.41	\$48.35
5	52	\$25.01	\$13.20	\$12.08	\$1.51	\$51.80
6	52	\$25.01	\$13.20	\$12.33	\$1.52	\$52.06
7	60	\$28.86	\$13.20	\$13.70	\$1.67	\$57.43
8	65	\$31.27	\$13.20	\$14.65	\$1.77	\$60.89
9	75	\$36.08	\$13.20	\$16.56	\$1.98	\$67.82
10	85	\$40.89	\$13.20	\$17.96	\$2.16	\$74.21

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$20.90	\$13.20	\$5.89	\$0.00	\$39.99
2	42	\$20.90	\$13.20	\$5.89	\$0.00	\$39.99
3	47	\$23.38	\$13.20	\$11.13	\$1.43	\$49.14
4	47	\$23.38	\$13.20	\$11.13	\$1.43	\$49.14
5	52	\$25.87	\$13.20	\$12.08	\$1.53	\$52.68
6	52	\$25.87	\$13.20	\$12.33	\$1.54	\$52.94
7	60	\$29.85	\$13.20	\$13.70	\$1.70	\$58.45
8	65	\$32.34	\$13.20	\$14.65	\$1.82	\$62.01
9	75	\$37.31	\$13.20	\$16.56	\$2.01	\$69.08
10	85	\$42.29	\$13.20	\$17.96	\$2.20	\$75.65

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP < 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$34.54	\$12.41	\$12.70	\$0.00	\$59.65
	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
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$34.83	\$12.41	\$12.70	\$0.00	\$59.94
	12/01/2019	\$34.83	\$12.41	\$13.72	\$0.00	\$60.96
	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 FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1</i>	10/01/2019	\$60.48	\$9.47	\$19.60	\$0.00	\$89.55
	01/01/2020	\$60.07	\$9.68	\$19.80	\$0.00	\$89.55
	03/01/2020	\$61.98	\$9.47	\$19.60	\$0.00	\$91.05
	10/01/2020	\$63.48	\$9.47	\$19.60	\$0.00	\$92.55
	03/01/2021	\$64.98	\$9.47	\$19.60	\$0.00	\$94.05

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1**Effective Date -** 10/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.17	\$9.47	\$11.15	\$0.00	\$41.79
2	40	\$24.19	\$9.47	\$11.80	\$0.00	\$45.46
3	45	\$27.22	\$9.47	\$12.45	\$0.00	\$49.14
4	50	\$30.24	\$9.47	\$13.10	\$0.00	\$52.81
5	55	\$33.26	\$9.47	\$13.75	\$0.00	\$56.48
6	60	\$36.29	\$9.47	\$14.40	\$0.00	\$60.16
7	65	\$39.31	\$9.47	\$15.05	\$0.00	\$63.83
8	70	\$42.34	\$9.47	\$15.70	\$0.00	\$67.51
9	75	\$45.36	\$9.47	\$16.35	\$0.00	\$71.18
10	80	\$48.38	\$9.47	\$17.00	\$0.00	\$74.85

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.02	\$9.68	\$11.35	\$0.00	\$42.05
2	40	\$24.03	\$9.68	\$12.00	\$0.00	\$45.71
3	45	\$27.03	\$9.68	\$12.65	\$0.00	\$49.36
4	50	\$30.04	\$9.68	\$13.30	\$0.00	\$53.02
5	55	\$33.04	\$9.68	\$13.95	\$0.00	\$56.67
6	60	\$36.04	\$9.68	\$14.60	\$0.00	\$60.32
7	65	\$39.05	\$9.68	\$15.25	\$0.00	\$63.98
8	70	\$42.05	\$9.68	\$15.90	\$0.00	\$67.63
9	75	\$45.05	\$9.68	\$16.55	\$0.00	\$71.28
10	80	\$48.06	\$9.68	\$17.20	\$0.00	\$74.94

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3**STEAM BOILER OPERATOR***OPERATING ENGINEERS LOCAL 4*

06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN*OPERATING ENGINEERS LOCAL 4*

06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2019	\$38.33	\$13.00	\$16.82	\$0.00	\$68.15

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 03/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$15.33	\$13.00	\$0.46	\$0.00	\$28.79
2	40	\$15.33	\$13.00	\$0.46	\$0.00	\$28.79
3	45	\$17.25	\$13.00	\$13.42	\$0.00	\$43.67
4	45	\$17.25	\$13.00	\$13.42	\$0.00	\$43.67
5	50	\$19.17	\$13.00	\$13.73	\$0.00	\$45.90
6	55	\$21.08	\$13.00	\$14.03	\$0.00	\$48.11
7	60	\$23.00	\$13.00	\$14.34	\$0.00	\$50.34
8	65	\$24.91	\$13.00	\$14.66	\$0.00	\$52.57
9	70	\$26.83	\$13.00	\$14.96	\$0.00	\$54.79
10	75	\$28.75	\$13.00	\$15.27	\$0.00	\$57.02

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2019	\$53.34	\$10.75	\$21.30	\$0.00	\$85.39
	02/01/2020	\$53.98	\$10.75	\$21.30	\$0.00	\$86.03
	08/01/2020	\$55.33	\$10.75	\$21.45	\$0.00	\$87.53
	02/01/2021	\$55.97	\$10.75	\$21.45	\$0.00	\$88.17
	08/01/2021	\$57.37	\$10.75	\$21.61	\$0.00	\$89.73
	02/01/2022	\$57.96	\$10.75	\$21.61	\$0.00	\$90.32

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental 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

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.99	\$10.75	\$21.30	\$0.00	\$59.04
2	60	\$32.39	\$10.75	\$21.30	\$0.00	\$64.44
3	70	\$37.79	\$10.75	\$21.30	\$0.00	\$69.84
4	80	\$43.18	\$10.75	\$21.30	\$0.00	\$75.23
5	90	\$48.58	\$10.75	\$21.30	\$0.00	\$80.63

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER LABORERS - FOUNDATION AND MARINE	06/01/2019	\$40.50	\$7.85	\$16.05	\$0.00	\$64.40
	12/01/2019	\$41.50	\$7.85	\$16.05	\$0.00	\$65.40
	06/01/2020	\$42.49	\$7.85	\$16.05	\$0.00	\$66.39
	12/01/2020	\$43.47	\$7.85	\$16.05	\$0.00	\$67.37
	06/01/2021	\$44.49	\$7.85	\$16.05	\$0.00	\$68.39
	12/01/2021	\$45.50	\$7.85	\$16.05	\$0.00	\$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER LABORERS - FOUNDATION AND MARINE	06/01/2019	\$39.22	\$7.85	\$16.05	\$0.00	\$63.12
	12/01/2019	\$40.22	\$7.85	\$16.05	\$0.00	\$64.12
	06/01/2020	\$41.21	\$7.85	\$16.05	\$0.00	\$65.11
	12/01/2020	\$42.19	\$7.85	\$16.05	\$0.00	\$66.09
	06/01/2021	\$43.21	\$7.85	\$16.05	\$0.00	\$67.11
	12/01/2021	\$44.22	\$7.85	\$16.05	\$0.00	\$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER LABORERS - FOUNDATION AND MARINE	06/01/2019	\$39.10	\$7.85	\$16.05	\$0.00	\$63.00
	12/01/2019	\$40.10	\$7.85	\$16.05	\$0.00	\$64.00
	06/01/2020	\$41.09	\$7.85	\$16.05	\$0.00	\$64.99
	12/01/2020	\$42.07	\$7.85	\$16.05	\$0.00	\$65.97
	06/01/2021	\$43.09	\$7.85	\$16.05	\$0.00	\$66.99
	12/01/2021	\$44.10	\$7.85	\$16.05	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$35.12	\$12.41	\$12.70	\$0.00	\$60.23
	12/01/2019	\$35.12	\$12.41	\$13.72	\$0.00	\$61.25
	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 <i>LABORERS (COMPRESSED AIR)</i>	06/01/2019	\$51.38	\$7.85	\$16.45	\$0.00	\$75.68
	12/01/2019	\$52.38	\$7.85	\$16.45	\$0.00	\$76.68
	06/01/2020	\$53.37	\$7.85	\$16.45	\$0.00	\$77.67
	12/01/2020	\$54.35	\$7.85	\$16.45	\$0.00	\$78.65
	06/01/2021	\$55.37	\$7.85	\$16.45	\$0.00	\$79.67
	12/01/2021	\$56.38	\$7.85	\$16.45	\$0.00	\$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	06/01/2019	\$53.38	\$7.85	\$16.45	\$0.00	\$77.68
	12/01/2019	\$54.38	\$7.85	\$16.45	\$0.00	\$78.68
	06/01/2020	\$55.37	\$7.85	\$16.45	\$0.00	\$79.67
	12/01/2020	\$56.35	\$7.85	\$16.45	\$0.00	\$80.65
	06/01/2021	\$57.37	\$7.85	\$16.45	\$0.00	\$81.67
	12/01/2021	\$58.38	\$7.85	\$16.45	\$0.00	\$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2019	\$43.45	\$7.85	\$16.45	\$0.00	\$67.75
	12/01/2019	\$44.45	\$7.85	\$16.45	\$0.00	\$68.75
	06/01/2020	\$45.44	\$7.85	\$16.45	\$0.00	\$69.74
	12/01/2020	\$46.42	\$7.85	\$16.45	\$0.00	\$70.72
	06/01/2021	\$47.44	\$7.85	\$16.45	\$0.00	\$71.74
	12/01/2021	\$48.45	\$7.85	\$16.45	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2019	\$45.45	\$7.85	\$16.45	\$0.00	\$69.75
	12/01/2019	\$46.45	\$7.85	\$16.45	\$0.00	\$70.75
	06/01/2020	\$47.44	\$7.85	\$16.45	\$0.00	\$71.74
	12/01/2020	\$48.42	\$7.85	\$16.45	\$0.00	\$72.72
	06/01/2021	\$49.44	\$7.85	\$16.45	\$0.00	\$73.74
	12/01/2021	\$50.45	\$7.85	\$16.45	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	08/01/2019	\$34.54	\$12.41	\$12.70	\$0.00	\$59.65
	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 <i>LABORERS - ZONE 2</i>	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	09/01/2019	\$57.69	\$11.82	\$17.01	\$0.00	\$86.52
	03/01/2020	\$59.19	\$11.82	\$17.01	\$0.00	\$88.02
	09/01/2020	\$60.69	\$11.82	\$17.01	\$0.00	\$89.52
	03/01/2021	\$62.19	\$11.82	\$17.01	\$0.00	\$91.02
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$28.83	\$8.75	\$1.86	\$0.00	\$39.44
	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$40.84	\$8.75	\$10.02	\$0.00	\$59.61
	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$33.64	\$8.75	\$9.86	\$0.00	\$52.25
	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$40.84	\$8.75	\$14.10	\$0.00	\$63.69
	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$36.04	\$8.75	\$10.65	\$0.00	\$55.44
	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$21.62	\$8.75	\$1.65	\$0.00	\$32.02
	08/30/2020	\$22.25	\$9.25	\$1.67	\$0.00	\$33.17
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$48.05	\$8.75	\$17.19	\$0.00	\$73.99
	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$28.83	\$8.75	\$3.36	\$0.00	\$40.94
2	65	\$31.23	\$8.75	\$3.44	\$0.00	\$43.42
3	70	\$33.64	\$8.75	\$3.51	\$0.00	\$45.90
4	75	\$36.04	\$8.75	\$5.08	\$0.00	\$49.87
5	80	\$38.44	\$8.75	\$5.15	\$0.00	\$52.34
6	85	\$40.84	\$8.75	\$5.23	\$0.00	\$54.82
7	90	\$43.25	\$8.75	\$7.30	\$0.00	\$59.30

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	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. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.						
TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/31/2016	\$16.32	\$3.55	\$0.00	\$0.00	\$19.87

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.						

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.

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SECTION 01 11 13

SUMMARY OF WORK

PART 1 – GENERAL

1.1 LOCATION AND DESCRIPTION OF WORK

- A. The Town of Wilmington has experienced issues with solids and other objects causing blockages, clogging and related issues with the pumps at the Pilcher Drive Pump Station. The CONTRACTOR shall provide all materials, equipment, labor, and supervision to perform sewer pipeline cleaning, CCTV inspection, remove and replace approximately 60 linear feet of 15-inch gravity sewer, furnish and install a new sewer manhole with an access hatch, new channel grinder, new rail system to raise and lower said channel grinder, new grinder control panel, new fencing, new access gate, new trees/shrubs, and all associated appurtenances. The grinder shall be anchored in the invert of the new sewer manhole. The CONTRACTOR shall install buried electrical conduit and wiring and use the pump station's existing electrical service to power the grinder. The CONTRACTOR shall use the existing alarm panel/autodialer for the necessary grinder alarm(s) to be connected. The Work is inclusive of all ancillary methods necessary to complete the Work.
- B. The location, general characteristics, and principal details of the Work are indicated on the plans entitled: Town of Wilmington, MA, "PILCHER DRIVE PUMP STATION WASTEWATER GRINDER INSTALLATIONS".

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 14 16

COORDINATION WITH OWNER'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. This Section includes requirements for coordinating with OWNER's operations during the Work, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on OWNER's operations except as allowed in this Section.
 - 2. CONTRACTOR shall provide labor, materials, tools, equipment and incidentals shown, specified and required to coordinate with OWNER's operations during the Work.
- B. Coordination:
 - 1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.
- C. Related Sections:
 - 1. Section 01 11 13, Summary of Work.
 - 2. Section 01 51 41.00, Temporary Pumping.
 - 3. Section 01 73 29, Cutting and Patching.
- D. Except for shutdowns specified in this Section, perform the Work such that OWNER's facility remains in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede OWNER's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.
- E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed at any time during regular working hours in accordance with the General Conditions and Supplementary Conditions, subject to the requirements in this Section.
- F. CONTRACTOR has the option of providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to OWNER, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect OWNER's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

- G. Coordinate shutdowns with OWNER and ENGINEER. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on OWNER's operations and processes.
- H. Do not shut off or disconnect existing operating systems, unless accepted by ENGINEER in writing. Operation of existing equipment will be by OWNER unless otherwise specified or indicated. Where necessary for the Work, CONTRACTOR shall seal or bulkhead OWNER-operated gates and valves to prevent leakage that may affect the Work, OWNER's operations, or both. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of ENGINEER.
- I. Bypassing:
 - 1. Flow into the pump station shall be maintained at all times during construction. Temporary pumping is acceptable.
- J. Requirements for temporary pumping are in Section 01 51 41.00, Temporary Pumping, and indicated on the Drawings. Requirements for temporary pumping associated with specific shutdowns are in this Section.

1.2 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Substitute Sequence Submittal: When deviation from specified sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that OWNER's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule.
- B. Informational Submittals: Submit the following:
 - 1. Shutdown Planning Submittal:
 - a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for OWNER to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.
 - b. Furnish submittal to ENGINEER at least thirty days prior to proposed shutdown start date. Do not start shutdown until obtaining ENGINEER's acceptance of shutdown planning submittal.
 - 2. Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to OWNER and ENGINEER of date and time each shutdown is to start. Provide notification at least (72) hours in advance of each shutdown.

1.3 GENERAL CONSTRAINTS

- A. Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for OWNER'S equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by OWNER after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.
- B. The following constraints apply to coordination with OWNER's operations:
 - 1. Operational Access: OWNER'S personnel shall have access to equipment and areas that remain in operation.
 - 2. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of OWNER.
 - 3. Draining and Cleaning of Conduits, Tanks, and Basins:
 - a. Unless otherwise specified, CONTRACTOR shall dewater process tanks, manholes, basins, conduits, and pipelines at beginning of each shutdown. Flush, wash down, and clean tanks, basins, pipelines, conduits, and other work areas.
 - b. CONTRACTOR shall remove liquids and solids and dispose of them at appropriate location at the Site as directed by ENGINEER. Unless otherwise specified or indicated, contents of pipes, tanks, basins, and conduits undergoing modifications shall be transferred to existing process tanks or conduits at the Site with capacity sufficient to accept such discharges, using hoses, piping, pumps, or other means provided by CONTRACTOR. Discharge of fluids across floors is not allowed.
 - c. If drainage point is not available on the piping or conduit to be drained, provide a wet tap using tapping saddle and valve or other method approved by ENGINEER. Uncontrolled spillage of contents of pipes or conduits is not allowed.
 - d. Spillage shall be brought to ENGINEER's attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. CONTRACTOR shall wash down spillage to floor drains or sumps and flush the system to prevent clogging and odors. If spillage is not suitable for discharge to the drainage system, such as chemical spills, as determined by ENGINEER, CONTRACTOR shall remove spillage by other method, such as vacuum truck, acceptable to ENGINEER.

1.4 SEQUENCE OF WORK

- A. Perform the Work in the specified sequence. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if OWNER's operations are not adversely affected by proposed sequence change, with ENGINEER's acceptance.

1.5 SHUTDOWNS

- A. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. CONTRACTOR shall lock out and tag circuit breakers and switches operated by OWNER and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify ENGINEER that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

- A. In addition to requirements of this Section, conform to requirements of Section 01 73 29, Cutting and Patching.

+ + END OF SECTION + +

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The items listed starting with Article 1.5 of this Section refer to and are the same pay items listed in the Bid Form and constitute all pay items for completing the Work. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, CONTRACTOR's or ENGINEER's field offices, layout surveys, Project signs, sanitary requirements, testing, safety provisions and safety devices, submittals and record drawings, water supplies, environmental and erosion controls, power and fuel, traffic maintenance, removal of waste, security, coordination with OWNER's operations, dewatering, bypass pumping, backfill, removing and disposing of concrete, excavation, trench shoring, information technology (including hardware, software, and services) required during construction, bonds, insurance, or other requirements of the General Conditions, Supplementary Conditions, General Requirements, and other requirements of the Contract Documents. Compensation for all services, items, materials, and equipment shall be included in prices stipulated for the lump sum listed in this Section and included in the Contract.
- B. Each lump sum bid price shall include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

1.2 RELATED PROVISIONS

- A. Payments to CONTRACTOR: Refer to General Conditions, Supplementary Conditions, Agreement.
- B. Changes in Contract Price: Refer to General Conditions, and Supplementary Conditions.
- C. Schedule of Values: Refer to General Conditions, and Supplementary Conditions.

1.3 NONCONFORMANCE ASSESSMENT

- A. Remove and replace the Work, or portions of the Work, not conforming to the Contract Documents.
- B. If, in the opinion of the OWNER, it is not practical to remove and replace the Work, the OWNER will direct one of the following remedies:

1. The non-conforming Work will remain as is, but the bid price will be adjusted to a lower price at the discretion of the OWNER.
 2. The non-conforming Work will be modified as authorized by the OWNER, and the bid price will be adjusted to a lower price at the discretion of the OWNER, if the modified work is deemed to be less suitable than originally specified.
- C. The authority of the OWNER to assess the non-conforming work and identify payment adjustment is final.

1.4 NONPAYMENT FOR REJECTED PRODUCTS

- A. Payment will not be made for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable to the OWNER.
 2. Products determined as non-conforming before or after placement.
 3. Products not completely unloaded from transporting vehicle.
 4. Products placed beyond the lines and levels of the required Work.
 5. Products remaining on hand after completion of the Work, unless specified otherwise.
 6. Loading, hauling, and disposing of rejected products.

1.5 BID ITEMS

- A. Item 1 – Site Work
1. Measurement and Payment: Lump sum payment for Item 1 will be full compensation for all labor, materials, tools, equipment and supervision required for site work, including, but not limited to: providing and maintaining erosion and sediment control measures, including but not limited to silt fence, wetland protection, inlet protection, pumped water filter bags, and straw bale barriers; demolition and disposal of chain link fencing; furnishing and installation of new chain link fencing; demolition and disposal of access gate and posts; furnishing and installation of new double leaf access gate and posts; removal and disposal of tree and shrubs; furnishing and installation of new trees and shrubs; excavation of paved and unpaved surfaces; protection of existing trees and shrubs to remain; protection of existing fencing to remain; restoration to paved and unpaved surfaces, furnishing and placing topsoil, seed, and fertilizer; disposal of excess materials and waste; and all other work shown on the Contract Drawings and required for complete site restoration and cleanup not included in other bid items.
- B. Item 2 – Pump Station Wastewater Grinder Installation:
1. Measurement and Payment: Lump sum payment for Item 2 will be full compensation for all labor, materials, tools, equipment and supervision required to furnish and install new wastewater channel grinder and frame,

grinder rail system, new grinder control panel, buried electrical conduit and wiring, connections to existing pump station electrical service, connection to existing alarm panel/autodialer for the necessary grinder alarm(s), and other ancillary items to complete the installation, testing, and startup of the new wastewater sewer grinder. Item 2 also includes temporary sewer flow bypass operations; earth excavation, including rock removal, all temporary sheeting, shoring, bracing, steep slope anchors, or trench plugs required; pavement saw cutting; excavation dewatering; providing and installing foundation bedding material; installing select backfill material to grade; compacting select backfill; temporary and permanent pavement; test pits; and site restoration. Item 2 also includes hauling and stockpiling of excavated soil which are unsuitable for use as backfill to a suitable and approvable disposal site. Item 2 also includes work required in locating, supporting and protecting existing utilities while trenching under or alongside a utility. Also included are the protection of overhead and underground telephone or electrical lines and the supporting of poles if required.

C. Item 3 – New Sanitary Sewer Manhole and 15-inch Gravity Sewer

1. Measurement and Payment: Lump sum payment for Item 3 will be full compensation for providing all labor, materials, equipment, tools and incidentals for installation of new sanitary sewer manhole with access hatch and, new PVC sewer pipe, adapters; temporary sewer bypass pumping and CCTV inspection of existing sanitary sewer; demolition and disposal of existing sewer, connection to existing manhole, connection to existing sewer pipe, and other ancillary items to complete the installation of new sewer pipes and manhole, as shown on the Contract Drawings. Item 3 also includes temporary sewer flow bypass operations; earth excavation, including rock removal, all temporary sheeting, shoring, bracing, steep slope anchors, or trench plugs required; pavement saw cutting; excavation dewatering; providing and installing foundation bedding material; installing select backfill material to grade; compacting select backfill; temporary and permanent pavement; test pits; and site restoration. Item 3 also includes hauling and stockpiling of excavated soil which are unsuitable for use as backfill to a suitable and approvable disposal site. Item 3 also includes work required in locating, supporting and protecting existing utilities while trenching under or alongside a utility. Also included are the protection of overhead and underground telephone or electrical lines and the supporting of poles if required.

D. Item 4 – Cured-in-Place Spot Repair (CIPSR) Liner

1. Measurement and Payment: Lump sum payment for Item 4 will be full compensation for providing all labor, materials, equipment, tools and incidentals for CIPSR liner installation as shown on the plans and in accordance with Section 33 01 30.73, Cured-In-Place Spot Repair. The lump sum shall also include pipeline cleaning and CCTV inspection in accordance with Section 33 01 30.41, Cleaning of Sewers and Section 33 01 30.16, Television Inspection of Sewers, dewatering of pipe sags, temporary removal of wet well grate, bypass pumping operations, flow plugging, pre and post CCTV inspections, warranty inspections, reports, external hard drives (with

inspection videos and reports), and reproductions, review of pertinent drawings and specifications, design of liner thickness, sampling and testing of liner, clearing obstructions, and erosion control (where applicable), removal and disposal of excess material, transportation and disposal fees, and all other items necessary to perform the work as specified in Section 33 01 30.73 Cured-In-Place Spot Repair.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide submittals in accordance with the General Conditions as modified by the Supplementary Conditions, and this Section.
2. Provide submittals well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of material or equipment and to implement procedures following ENGINEER's approval or acceptance of the associated submittal. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.
3. CONTRACTOR is responsible for dimensions to be confirmed and corrected at the Site, for information pertaining solely to the fabrication processes and to techniques of construction, and for coordinating the work of all trades. CONTRACTOR's signature of submittal's stamp and letter of transmittal shall be CONTRACTOR's representation that CONTRACTOR has met his obligations under the Contract Documents relative to that submittal.

1.2 TYPES OF SUBMITTALS

- A. Submittal types are classified as follows: 1) Action Submittals, 2) Informational Submittals, 3) Closeout Submittals, and 4) Maintenance Material Submittals. Type of each required submittal is designated in the respective Specification Sections; when type of submittal is not specified in the associated Specification Section, submittal will be classified as follows:
1. Action Submittals include:
 - a. Shop Drawings.
 - b. Product data.
 - c. Testing plans, procedures, and testing limitations.
 2. Informational Submittals include:
 - a. Certificates.
 - b. Design data not sealed and signed by a design professional retained by CONTRACTOR, Subcontractor, or Supplier.
 - c. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.
 3. Closeout Submittals include:
 - a. Operations and maintenance data.
 - b. Warranty documentation.
 - c. Record documentation.

4. Maintenance Material Submittals include:
 - a. Spare parts.
 - b. Extra stock materials.
 - c. Tools.
 5. When type of submittal is not specified and is not included in the list above, ENGINEER will determine the type of submittal.
- B. Not Included in this Section: Administrative and procedural requirements for following are covered elsewhere in the Contract Documents:
1. Requests for interpretations of the Contract Documents.
 2. Change Orders, Work Change Directives, and Field Orders.
 3. Applications for Payment
 4. Progress Schedules.
 5. Photographic documentation.
 6. Reports and documentation required in accordance with applicable permits
 7. Site survey data.

1.3 SUBMITTALS REQUIRED IN THIS SECTION

- A. Informational Submittals: Provide the following:
1. Schedule of Submittals:
 - a. Timing:
 - 1) Provide submittal within time frames specified in the Contract Documents.
 - 2) Provide updated Schedule of Submittals with each submittal of the updated Progress Schedule.
 - b. Content: In accordance with the General Conditions as modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path. Indicate the following for each submittal:
 - 1) Date by which submittal will be provided to ENGINEER.
 - 2) Whether submittal will be for a substitution or "equal". Procedures for substitutions and "or equals" are specified in the General Conditions and the Division 01 Specifications
 - 3) Date by which ENGINEER's response is required. At least 14 days shall be allowed from ENGINEER's receipt of each submittal. Allow increased time for large or complex submittals.
 - 4) For submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors.
 - c. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules.
 - d. Coordinate Schedule of Submittals with the Progress Schedule.

- e. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that places extraordinary demands on ENGINEER for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.
- f. In preparing Schedule of Submittals:
 - 1) Considering the nature and complexity of each submittal, allow sufficient time for review and revision.
 - 2) Reasonable time shall be allowed for: ENGINEER's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to CONTRACTOR.
 - 3) Identify and accordingly schedule submittals that are expected to have long anticipated review times.

1.4 PROCEDURE FOR SUBMITTALS

- A. Submittal Identification System: Use the following submittal identification system, consisting of submittal number and review cycle number.
 - 1. Submittal Number: Shall be separate and unique number correlating to each individual submittal required. CONTRACTOR shall assign submittal number as follows:
 - a. First part of submittal number shall be the applicable Specification Section number, followed by a hyphen.
 - b. Second part of submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique submittal provided under the associated Specification Section.
 - c. Typical submittal number for the third submittal provided for Section 40 05 19, Ductile Iron Process Pipe, would be "40 05 19-003".
 - 2. Review Cycle Number: Shall be a letter designation indicating the initial submittal or re-submittal associated with each submittal number:
 - a. "A" = Initial (first) submittal.
 - b. "B" = Second submittal (e.g., first re-submittal).
 - c. "C" = Third submittal (e.g., second re-submittal).
 - 3. Examples:

Example Description	Submittal Identification	
	Submittal No.	Review Cycle
Initial (first) review cycle of the third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	A
Second review cycle (first re-submittal) of third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	B

- B. Letter of Transmittal for Submittals:
 - 1. Provide separate letter of transmittal with each submittal. Each submittal shall be for one Specification Section.

2. At beginning of each letter of transmittal, provide a reference heading indicating: CONTRACTOR's name, OWNER's name, Project name, Contract name and number, transmittal number, and submittal number.
3. For submittals with proposed deviations from requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

C. Contractor's Review and Stamp:

1. Contractor's Review: Before transmitting submittals to ENGINEER, review submittals to:
 - a. assure proper coordination of the Work;
 - b. determine that each submittal is in accordance with CONTRACTOR's desires;
 - c. verify that submittal contains sufficient information for ENGINEER to determine compliance with the Contract Documents.
2. Incomplete or inadequate submittals will be returned without review.
3. Contractor's Stamp and Signature:
 - a. Each submittal provided shall bear CONTRACTOR's stamp of approval and signature, as evidence that submittal has been reviewed by CONTRACTOR and verified as complete and in accordance with the Contract Documents.
 - b. Submittals without CONTRACTOR's stamp and signature will be returned without review. Signatures that appear to be computer-generated will be regarded as unsigned and the associated submittal will be returned without review.
 - c. CONTRACTOR's stamp shall contain the following:

"Project Name: _____

Contractor's Name: _____

Date: _____

----- *Reference* -----

Item/Submittal Title: _____

Specifications: _____

Section: _____

Page No.: _____

Paragraph No.: _____

Drawing No.: _____ of _____

Location of Work: _____

Submittal No. and Review Cycle: _____

Coordinated by Contractor with Submittal Nos.: _____

I hereby certify that the Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this submittal.

Approved By (for Contractor): _____”

D. Submittal Marking and Organization:

1. Mark on each page of submittal and each individual component submitted with submittal number and applicable Specification paragraph.
2. Arrange submittal information in same order as requirements are written in the associated Specification Section.
3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to ENGINEER.
4. Package together submittals for the same Specification Section. Do not provide required information piecemeal.

E. Format of Submittal and Recipients:

1. Action Submittals and Informational Submittals: Furnish in accordance with Table 01 33 00-A, except that submittals of Samples shall be as specified elsewhere in this Section:

**TABLE 01 33 00-A: SUBMITTAL CONTACTS
AND REQUIRED COPIES**

	Address for Deliveries	Contact Person	E-mail Address	No. of Hard-copies	Remarks
a.	Engineer: ARCADIS, U.S., Inc. 200 Harvard Mills Square, Suite 430 Wakefield, MA 01880	Sean Mitchell	Sean.Mitchell@Arcadis-US.com	Three	
Notes: TBD = To Be Determined					

2. Closeout Submittals:

- a. Provide the following Closeout Submittals in accordance with Table 01 33 00-A: maintenance contracts; bonds for specific products or systems; warranty documentation; and sustainable design closeout documentation. On documents such as maintenance contracts and bonds, include on each document furnished original signature of entity issuing the document.
 - b. Operations and Maintenance Data: in accordance with General Conditions.
 - c. Record Documentation: in accordance with General Conditions..
 - d. Software: Submit number of copies required in Specification Section where the software is specified. If number of copies is not specified, provide two copies on compact disc in addition to software loaded on to OWNER's computer(s).
- 3. Maintenance Material Submittals:** For spare parts, extra stock materials, and tools, submit quantity of items specified in associated Specification Section, and General Conditions.

F. Distribution:

1. Distribution of Hardcopies: ENGINEER will distribute each reviewed submittal requiring ENGINEER's written response as follows:
 - a. CONTRACTOR: 1 copy (except closeout submittals and maintenance material submittals).
 - b. OWNER: 1 copy.
 - c. ENGINEER's File: 1 copy.
- G. Resubmittals: Refer to the General Conditions for requirements regarding resubmitting required submittals.

1.5 ENGINEER'S REVIEW

- A. Timing: ENGINEER's review will conform to timing accepted by ENGINEER in the accepted Schedule of Submittals.
- B. Submittals not required in the Contract Documents will not be reviewed by ENGINEER and will not be recorded in ENGINEER's submittal log. All hardcopies of such submittals will be returned to CONTRACTOR.
- C. Action Submittals, Results of ENGINEER's Review: Each submittal will be given one of the following dispositions:
 1. Approved: Upon return of submittal marked "Approved", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents.
 2. Approved as Corrected: Upon return of submittal marked "Approved as Corrected", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, provided it is in accordance with corrections indicated.
 3. Approved as Corrected – Resubmit: Upon return of submittal marked "Approved as Corrected – Resubmit", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, provided it is in accordance with corrections indicated. Provide to ENGINEER record re-submittal with all corrections made. Receipt of corrected re-submittal is required before materials or equipment covered in the submittal will be eligible for payment.
 4. Revise and Resubmit: Upon return of submittal marked "Revise and Resubmit", make the corrections indicated and re-submit to ENGINEER for approval.
 5. Not Approved: This disposition indicates material or equipment that cannot be approved. Upon return of submittal marked "Not Approved", repeat initial submittal procedure utilizing approvable material or equipment.

- D. Informational Submittals, Results of ENGINEER's Review:
1. Each submittal will be given one of the following dispositions:
 - a. Accepted: Information included in submittal conforms to the applicable requirements of the Contract Documents, and is acceptable. No further action by CONTRACTOR is required relative to this submittal, and the Work covered by the submittal may proceed, and products with submittals with this disposition may be shipped or operated, as applicable.
 - b. Not Accepted: Submittal does not conform to applicable requirements of the Contract Documents and is not acceptable. Revise submittal and re-submit to indicate acceptability and conformance with the Contract Documents.
- E. Closeout Submittals, Results of ENGINEER's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Closeout Submittals will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When Closeout Submittal is not acceptable, ENGINEER will provide written response to CONTRACTOR.
- F. Maintenance Material Submittals, Results of ENGINEER's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Maintenance Material Submittals will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When Maintenance Material Submittal is not acceptable, ENGINEER will provide written response to CONTRACTOR, and CONTRACTOR is responsible for costs associated with transporting and handling of maintenance materials until compliance with the Contract Documents is achieved.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01 35 26.23

CONTRACTOR REQUIREMENTS FOR CONFINED SPACE ENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Portions of the Site may constitute “confined spaces” as defined in 29 CFR §1926.21(b)(2) and 1910.146. Accordingly, incorporate into CONTRACTOR’s Safety Plan for the Site appropriate measures to protect the health and safety of all persons on the Site or who may be affected by the Work, including, without limitation thereby, employees and representatives of the CONTRACTOR, any Subcontractor, OWNER, or ENGINEER while they are present and engaged in the performance of their duties on the Site. This Section applies to all personnel locations of the Work where confined space entry occurs.
- B. This Contract requires work in excavations, active sewers, manholes, open pits, and other confined spaces. Follow all federal, state and local requirements for safety in confined spaces.
- C. Safeguard workers from unsafe atmospheres while entering or occupying any confined space.

1.2 REFERENCE STANDARDS

- A. Conform all guidelines set forth by:
 - 1. The Occupational Safety and Health Administration (OSHA) Federal Regulations; 29 CR Ch. XVII, Section 1910.146 Confined Space Entry.

1.3 SUBMITTALS

- A. Prepare and submit for information only a Site-specific Confined Space Entry Plan conforming to current OSHA and state regulations.
- B. Confined Space Entry Certificates for applicable personnel.
- C. Copies of Confined Space Entry Permits, submitted daily.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONFINED SPACE PRACTICES

- A. Comply with CONTRACTOR’s Confined Space Entry Plan.
- B. Recordkeeping: Using the example forms attached to this Section, or other forms required by CONTRACTOR, OWNER, or other authority having jurisdiction, issue for each instance of access to permit-required confined space, completed permit(s) and completed associated data sheet. File completed permit(s) and data

sheet(s) in the Site-Specific Confined Space Entry Plan and submit in accordance with Article 1.3 of this Section.

3.2 SUPPLEMENTS

- A. The example forms listed below, following the “End of Section” designation, are part of this Specification Section:
1. Confined Space Data Sheet (one page).
 2. Confined Space Entry Permit (two pages).
 3. Confined Space Hot Work Permit (one page).

+ + END OF SECTION + +

CONFINED SPACE DATA SHEET

Name of Confined Space: _____

Location of Confined Space: _____

Contractor/Subcontractor Accessing Confined Space: _____

PRE-ENTRY SYSTEM CONTROL

Mechanical: Isolate, lockout and de-energize to zero potential energy.

Engulfment: Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.

Electrical: Lockout/Tag-out

Inerting: Flush/Purge/Vent

Special Precautions: _____

Check

☐☐☐☐

ATMOSPHERE

Date of Last-measured Values: _____

	Oxygen	Explosive	H ₂ S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H ₂ S	< 35 ppm	--	--
Last Measured						
Values This Entry						

SITE AND PERSONAL SAFETY (check if required, list type where applicable)

Personal Protective Equipment:

Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐.

Hand ☐. Foot ☐. Respiratory ☐ (type) _____. Clothing ☐ (type) _____

Other: ☐ _____

Rescue and Emergency Equipment:

Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Ladder ☐. Other ☐ _____

Equipment on Standby for Rescue Personnel ☐ _____

Site Safety:

Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type) _____. Postings/Flagging ☐.

Other ☐ _____

List specific equipment isolated, de-energized, and locked out.

CONFINED SPACE ENTRY PERMIT

ENTRY TEAM

Contractor/Subcontractor Accessing Confined Space: _____

Facility: _____

Specific Confined Space Being Entered: _____

Purpose of Entry (describe the work to be done): _____

Date: _____ Time: _____ Expected Job Duration (days/hours): _____

Entry Supervisor: _____ Designated Attendant: _____

Authorized/Qualified Entrants:

Entry Team Rotation:

Date: _____ Time: _____

Entry Supervisor: _____ Designated Attendant: _____

Authorized/Qualified Entrants:

Entry Team Rotation:

Date: _____ Time: _____

Entry Supervisor: _____ Designated Attendant: _____

Authorized/Qualified Entrants:

Communication Procedures:

Entry Team: _____

Standby/Rescue Personnel: _____

Sign Offs:

Person Authorizing This Entry: _____

Entry Supervisor: _____

Person Terminating Permit: _____ Date: _____ Time: _____

Distribution to: _____

Attach to this permit a list of rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services.

Confined Space Entry Permit (PAGE 2 of 2)

PRE-ENTRY SYSTEM CONTROL

	<u>Check</u>	<u>Date/Initials</u>
Mechanical: Isolate, lockout and de-energize to zero potential energy.	<input type="checkbox"/>	_____
Engulfment: Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	<input type="checkbox"/>	_____
Electrical: Lockout/Tag-out	<input type="checkbox"/>	_____
Inerting: Flush/Purge/Vent	<input type="checkbox"/>	_____
Special Precautions: _____		_____

ATMOSPHERE - Tested by portable atmospheric monitor with audible and visual alarms.
No one will enter a space with an unsafe atmosphere without approval from the Division Superintendent/Assistant Superintendent.

	Oxygen	Explosive	H ₂ S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H ₂ S	< 35 ppm	--	--
Pre-Entry						
Post Ventilation						
Continuous						
Continuous						
Continuous						

Ventilation Used (circle one): Mechanical Natural

Special Precautions: (See Confined Space Data Sheet) _____

SITE AND PERSONAL SAFETY (check if required, list type where applicable)

Personal Protective Equipment:

Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐.
Hand ☐. Foot ☐. Respiratory ☐ (type) _____. Clothing ☐ (type) _____.
Other: ☐ _____

Rescue and Emergency Equipment:

Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Other ☐ _____.
Equipment on Standby for Rescue Personnel ☐ _____

Site Safety:

Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type) _____. Postings/Flagging ☐.
Other ☐ _____

List specific equipment isolated, de-energized, and locked out.

CONFINED SPACE HOT WORK PERMIT

Contractor/Subcontractor Accessing Confined Space for Hot Work: _____

Facility: _____

Specific Confined Space Being Entered: _____

Date: _____ **Time:** _____

Expected Job Duration (days/hours): _____

Purpose of Entry (describe the work to be done): _____

Explain Why Work Cannot be Done Outside of the Confined Space: _____

Safety Equipment Required:

Fire Extinguishers: **Yes** _____ **No** _____ **Number** _____

Type _____

Respirators: **Yes** _____ **No** _____ **Number** _____

Type _____

Other Equipment: _____

Authorizing Supervisor:

Print Name _____

Signature _____

Date Signed _____

SECTION 01 51 41

TEMPORARY PUMPING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide labor, materials, tools, equipment, and incidentals shown, specified and required for temporary pumping and handling of fluids during the Work.
2. Design and provide temporary pumping systems, including plugs, bulkheads, and line stops as required; pumps; piping, supports, and valves; temporary instrumentation and control system; fuel and electricity; personnel; and appurtenances. Conform to Laws and Regulations and requirements of authorities having jurisdiction. System shall be suitable for its service and operating environment.
3. Required capacity of temporary pumping systems is specified in Section 01 14 16, Coordination with Owner's Operations. Provide temporary pumping system of required capacity with at least one of the largest pumps out of service.
4. Location of the temporary pumping system shall not affect OWNER's operations and access at the Site, and public access to streets and drives, unless approved by ENGINEER and authorities having jurisdiction.
5. Provide electricity and fuel as required for temporary pumping system. Secondary containment for fuel tanks shall be in accordance with Laws and Regulations.
6. Leakage from temporary pumping system or improper discharge is not allowed.

B. Coordination:

1. Review installation procedures under other Sections and coordinate Work that must be performed with or before Work specified in this Section.

C. Related Sections:

1. Section 01 14 16, Coordination with Owner's Operations.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Temporary pumping system Supplier shall have at least five years of experience providing temporary pumping systems, and shall submit evidence of furnishing five temporary pumping systems on other projects similar in size and service to temporary pumping system required for the Project.

- B. Component Supply and Compatibility: Obtain each temporary pumping system from a single Supplier who shall be responsible for providing a complete system.

1.3 SUBMITTALS

- A. Timing: Furnish submittals for temporary pumping system to ENGINEER at least 30 days prior to delivery of temporary pumping system to the Site.
- B. Action Submittals: Submit the following:
 - 1. Temporary Pumping System Submittal: Submit the following for each temporary pumping system:
 - a. Manufacturer's data and specifications on each type and size of pump proposed and its capacity, including pump curves. Provide manufacturer's data and specifications for generators and other equipment required for temporary pumping system.
 - b. Technical information and specifications on noise controls for noise-generating equipment.
 - c. Technical data on temporary piping, pipe joints, valves, pipe supports, controls, flow meter, secondary containment for fuel tanks, and other information pertinent to the temporary pumping system.
 - d. Layout Drawings:
 - 1) Sketches showing proposed layout of temporary pumping system, including locations of temporary plugs, bulkheads, and line stops; suction and discharge locations; location of pumps and associated piping and valves; and source of power for temporary pumping system. Sketches shall be scale drawings acceptable to ENGINEER, and shall include site plans similar to those in the Contract Documents.
 - 2) Details of system suction and discharge locations. Discharge details shall include measures to protect the receiving structure and dissipate energy.
 - 3) Where temporary lines will be buried, submit trench details. Submit sketches and information on other types of protection proposed for temporary piping.
 - e. System curve of flow plotted against total dynamic head, and calculations that substantiate the proposed temporary pumping system, including comparison of net positive suction head required and net positive suction head available.
 - f. Temporary Plugs, Bulkheads, and Line Stops: Manufacturer's literature and fabrication drawings showing type of plug, bulkhead or line stop as applicable, materials, and hydrostatic head the plug, bulkhead, or line stop is designed to withstand. Submit complete technical information for CONTRACTOR-proposed line stops, installation procedures, name of proposed line stop installer, and documentation of experience on at least five similar projects.
 - g. Narrative on temporary pumping system operation, including who will operate the system, staffing, planned frequency of fueling, contingency

- plan in event of pump failure, and statement of existing systems that may be affected during operation of temporary pumping system.
- h. Schedule for temporary pumping system set-up, testing, use, and removal from the Site.

C. Informational Submittals: Submit the following:

- 1. Qualifications Statements:
 - a. Qualifications of temporary pumping system Supplier.

PART 2 – PRODUCTS

2.1 TEMPORARY PUMPING SYSTEM

A. General:

- 1. System components shall be suitable for continuous operation with the fluid pumped.
- 2. Provide noise controls for temporary pumping system. Noise emissions from temporary pumping system shall conform to Laws and Regulations and shall not exceed 70 db at a distance of thirty feet from noise source.
- 3. Fuel consuming temporary pumping system components intended for use when CONTRACTOR is not present shall include fuel tanks sized for at least twenty-four hours of uninterrupted operation at system's operating capacity, and means to automatically notify CONTRACTOR upon high and low suction water level and low fuel level.

B. Instrumentation and Controls:

- 1. Controls: Provide controls for temporary pumping system in accordance with Section 01 14 16, Coordination with Owner's Operations.

C. Temporary Piping System:

- 1. Piping shall be steel, ductile iron, high density polyethylene, or other material accepted by ENGINEER, and suitable for system operating pressures. Aluminum piping and PVC piping not mechanically restrained are not allowed. Hoses can be used only for short sections and with acceptance by ENGINEER.
- 2. Piping system shall have watertight joints of the following types: fused joints, restrained couplings, flanged coupling adapters, quick-connects by Camlok or equal, flanged joints, grooved and shouldered end-type couplings, and other watertight joints accepted by ENGINEER.
- 3. Size discharge piping for maximum velocity of 10 feet per second.
- 4. Provide check valves or approved pump control valves as required.
- 5. Provide air valves on discharge piping as required. Air valves shall expel air upon pipe filling and admit air upon pipe dewatering, and release small amounts of entrained air during operation. Air valves shall be suitable for service with the pumped fluid.

6. Discharge from temporary pumping system shall not adversely affect the existing process or facilities. Provide energy dissipating measures at discharge point as required.
- D. Temporary Plugs, Bulkheads, and Line Stops:
1. Acceptable temporary plugs and bulkheads include inflatable dams specifically designed for such service, brick bulkheads, timber bulkheads, sandbags, and other bulkhead methods suitable for the service. Line stops, where required, are specified in Division 40 of the Contract Documents.
 2. Each plug, temporary bulkhead, and line stop shall be suitable for the maximum pressure encountered.
 3. Where temporary plugs and bulkheads are under pressure or surcharged, provide either two plugs or a plug and temporary bulkhead.

PART 3 – EXECUTION

3.1 PREPARATION

- A. General:
1. Temporary piping shall be located off of roads, driveways, and sidewalks. Piping shall not be located in environmentally sensitive areas such as wetlands.
 2. Where required for OWNER's access to and operation of existing facilities, bury temporary piping that would otherwise inhibit access to processes, buildings, streets, and driveways. In paved areas, provide temporary surfacing, sufficient for AASHTO H-20 wheel loads over buried temporary piping.
 3. Perform successful hydrostatic testing of temporary piping system using clean water at pressure equal to 1.2 times highest expected system operating pressure, for one hour while maintaining test pressure within 3.0 psi of required test pressure. ENGINEER will witness hydrostatic test. Hydrostatic test criteria for acceptance: No leakage.
 4. Verify that entire temporary pumping system is ready for operation before commencing shutdown of OWNER's operations, facility, or systems. Verify that temporary pumping system controls and flow meter are properly connected and functional.

3.2 TEMPORARY PUMPING

- A. During Operation of the Temporary Pumping System:
1. Temporary pumping system shall operate continuously to facilitate construction activity. In the event of equipment failure, immediately make repairs or replace equipment. Provide spare parts and redundant units as necessary for continuous operation.
 2. Provide personnel to monitor, operate, and maintain temporary pumping system twenty-four hours per day when system is in service.

3.3 DEMOBILIZATION

- A. Upon Conclusion of Temporary Pumping:
1. Remove plugs, bulkheads, and line stops in manner that allows flow to slowly return to normal, without surging, surcharging, and adverse effects on existing system.
 2. Flush out temporary pumping system with clean water discharged to an appropriate location.
 3. Remove temporary pumping system and appurtenances from the Site.

+ + END OF SECTION + +

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SECTION 01 57 05

TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide and maintain methods, equipment, and temporary construction as required to control environmental conditions at the Site and adjacent areas.
2. Maintain controls until no longer required.
3. Temporary controls include, but are not limited to, the following:
 - a. Erosion and sediment controls.
 - b. Dust control.
 - c. Pest and rodent control.
 - d. Control of water, including stormwater runoff.
 - e. Pollution control.

B. Related Sections:

1. Section 31 20 00, Earth Moving

1.2 QUALITY ASSURANCE

- ###### A. Regulatory Requirements: Comply with all State and Town environmental controls requirements.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. Plan for construction staging and maintenance of the Site relative to erosion and sediment controls. Indicate on a Site plan approximate areas of planned disturbance of soils and soil cover over time during the Project. For areas not indicated in the Contract Documents as being disturbed and that CONTRACTOR proposes to disturb, Shop Drawing shall include proposed erosion and sediment control measures for the additional area.
2. Product Data:
 - a. Straw waddle product information.

B. Informational Submittals: Submit the following:

1. Procedural Submittals:
 - a. Proposed dust control measures, when submittal is requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

A. General:

1. Materials utilized for erosion and sediment controls shall be in accordance with the applicable regulatory requirements, unless otherwise shown or indicated in the Contract Documents.

B. Compost Filter Sock:

1. Filtration Media:

- a. Compost used for compost filter sock filler material (filtration media) shall be sanitized, weed free, mature compost and derived from a well-decomposed source of organic matter.
- b. Compost shall have no identifiable feedstock constituents or offensive odors. Compost shall be free of any refuse, contaminants or other materials toxic to plant growth.
- c. Compost shall be produced using aerobic composting process and shall meet all local, state, and Federal quality requirements. Biosolids compost shall meet Code of Federal Regulations (CFR) 503, including time and temperature data.
- d. Compost used for filtration media shall comply with the following. Test methods for the items below shall follow US Composting Council Test Methods for the Examination of Composting and Compost guidelines for laboratory procedures:
 - 1) pH: 5.0-8.0
 - 2) Particle Size: 99% passing a 2-inch sieve and a minimum of 70% greater than the 3/8-inch sieve.
 - 3) Moisture content of less than 60%.
 - 4) Material shall be relatively free (<1% by dry weight) of inert or foreign man made materials.

2. Compost Filter Sock:

- a. Filter Sock shall utilize an outer layer of filtration mesh, and an inner layer of containment netting.
- b. All layers shall collectively enclose the compost filtration media.
- c. Product and Manufacturer:
 - 1) BioSock, by EnviroTech BioSolutions.
 - 2) FilterSoxx, by Filtrexx.
 - 3) Silt Sock, by Silt Sock Erosion Control Products.
 - 4) Or equal.

3. Wood Anchor Stakes:

- a. Length: Three feet, minimum.
- b. Material: 2-inch by 2-inch hardwood.

PART 3 – EXECUTION

3.1 NOISE CONTROL

A. Noise Control – General:

1. CONTRACTOR's vehicles and equipment shall minimize noise emissions to greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary.
2. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.
3. Noise emissions shall not interfere with the work of OWNER or others.

3.2 DUST CONTROL

A. Dust Control – General:

1. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of ENGINEER and approval of authorities having jurisdiction.
2. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce on- and off-Site damage, nuisances, and health hazards associated with dust emissions. Control may be achieved by irrigation in which the Site shall be sprinkled with water until the surface is moist. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the Site.
3. Remove dust from roadways and access roads at maximum intervals of seven days by mechanical brooming or other method acceptable to ENGINEER.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:

1. Provide rodent and pest control as required to prevent infestation of the Site and storage areas.
2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.
3. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:

1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance.

- B. Equipment and Facilities for Water Control: Provide, operate, and maintain equipment and facilities of adequate size to control surface water.
- C. Discharge and Disposal: Dispose of drainage water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that complies with Laws and Regulations.

3.5 POLLUTION CONTROL

- A. Pollution Control – General:
 - 1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.
 - 2. Equipment used during construction shall comply with Laws and Regulations.
- B. Spills and Contamination:
 - 1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
 - 2. Excavate contaminated material and properly dispose of off-Site, and replace with suitable compacted fill and topsoil.
- C. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.
- D. Atmospheric Pollutants:
 - 1. Provide systems for controlling atmospheric pollutants related to the Work.
 - 2. Prevent toxic concentrations of chemicals and vapors.
 - 3. Prevent harmful dispersal of pollutants into atmosphere.
- E. Solid Waste:
 - 1. Provide systems for controlling and managing solid waste related to the Work.
 - 2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
 - 3. Properly handle and dispose of solid waste.

3.6 EROSION AND SEDIMENT CONTROL

- A. Installation and Maintenance of Erosion and Sediment Controls – General:
 - 1. General:
 - a. Provide erosion and sediment controls as shown and indicated on the Drawings and elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously undisturbed areas.

- b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements, unless otherwise shown or indicated in the Contract Documents.
 - c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and all regulatory requirements, to control erosion and sedimentation during the Project.
 - d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
 - e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provisions shall be made for regulating drainage and controlling erosion and sedimentation, subject to the ENGINEER'S approval.
 - f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.
2. Coordination:
 - a. Coordinate erosion and sediment controls with this Section's requirements on water control.
 - b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment control.
 3. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
 4. In general, implement construction procedures associated with, or that may effect, erosion and sediment control to ensure minimum damage to the environment during construction. CONTRACTOR shall implement any and all additional measures required to comply with Laws and Regulations.
 5. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
 6. Access Roads and Parking Areas: When possible, access roads and temporary roads shall be located and constructed to avoid adverse effects on the environment. Provisions shall be made to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
 7. Earthwork and Temporary Controls:
 - a. Perform excavation, fill, and related operations in accordance with Section 31 20 00 – Earth Moving.
 - b. Control erosion to minimize transport of silt from the Site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.

- c. Hold to a minimum the areas of bare soil exposed at one time.
 - d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
 - e. In performing earthwork, eliminate depressions that could serve as mosquito pools.
 - f. CONTRACTOR shall provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.
8. Inspection and Maintenance:
- a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; apply corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
 - b. Repair or replace damaged erosion and sediment controls within 24 hours of CONTRACTOR becoming aware of such damage.
 - c. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
9. Duration of Erosion and Sediment Controls:
- a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.
 - b. Maintain erosion and sediment controls until the Site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
10. Work Stoppage: If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
11. Failure to Provide Adequate Controls: In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and siltation, OWNER reserves the right to employ outside assistance or to use OWNER's own forces for erosion and sediment control. Cost of such work, plus engineering and inspection costs, will be deducted from monies due CONTRACTOR.

B. Erosion and Sediment Control:

- 1. Perform erosion and sediment control as directed by the Engineer and in accordance with Wilmington Conservation Commission requirements.

C. Compost Filter Socks:

- 1. Install compost filter socks in accordance with the requirements of this section and at the location(s) shown or indicated on the Drawings.
- 2. Installation:
 - a. Install parallel to the base of the slope or other disturbed area. For slopes of 2:1, a second compost filter sock shall be installed at the top of the slope.
 - b. Stakes shall be installed through the middle of the compost filter sock on ten foot centers, using wooden stakes. When compost filter socks are

- used on pavement, heavy concrete blocks shall be used behind the compost filter sock to stabilize.
- c. Embed wooden stakes in the ground to the depth necessary for proper controls; embed stakes to at least 16 inches below ground.
 - d. Where multiple sections of compost filter socks are required to form a continuous run, sections shall have a minimum overlap of 12 inches.
 - e. Loose compost may be backfilled along the upslope side of the compost filter sock, filling the seam between the soil surface and the sock.
3. Inspection and Maintenance:
- a. Inspect compost filter socks when rain is forecasted, following rain events, and daily during prolonged rainfall.
 - b. Maintain compost filter socks to provide adequate sediment holding capacity. Sediment shall be removed when sediment accumulation reaches one-half the original height of the barrier.
 - c. Repair, modify, or supplement compost filter sock installations as needed or as required by the ENGINEER.

3.7 REMOVAL OF TEMPORARY CONTROLS

- A. Removals – General:
- 1. Upon completion of the Work, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.
 - 2. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.

+ + END OF SECTION + +

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SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall perform cutting and coring, and rough and finish patching of holes and openings in existing construction.
2. Provide cutting, coring, fitting and patching, including attendant excavation and fill, required to complete the Work, and to:
 - a. remove and replace defective Work;
 - b. remove samples of installed Work as specified or required for testing;
 - c. remove construction required to perform required alterations or additions to existing work;
 - d. uncover the Work for ENGINEER's observation of covered Work or observation by authorities having jurisdiction;
 - e. connect to completed Work not performed in proper sequence;
 - f. remove or relocate existing utilities and pipes that obstruct the Work in locations where connections must be made;
 - g. make connections or alterations to existing or new facilities.

1.2 SUBMITTALS (NOT USED)

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials - General:

1. Use materials in conformance with the Contract Documents.
2. If not shown or indicated in the Contract Documents, use materials and products that are identical to existing materials and products affected by cutting and patching Work.
3. For exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.
4. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using materials that do not void required or existing warranties.

B. Compound Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:

1. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with solvent-free, two-component, epoxy protective coating.

PART 3 – EXECUTION

3.1 GENERAL

- A. Perform cutting and coring in such manner that limits extent of patching.
- B. Structural Elements: Do not cut or patch structural elements in manner that would change structural element's load-carrying capacity as load deflection ratio.
- C. Operating Elements: Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.
- D. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using methods that do not void required or existing warranties.

3.2 INSPECTION

- A. Examine surfaces to be cut or patched and conditions under which cutting or patching are to be performed before starting cutting or patching work.
- B. Report unsatisfactory or questionable conditions to ENGINEER in writing. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.3 PREPARATION

- A. Provide temporary support required to maintain structural integrity of Project, to protect adjacent Work from damage during cutting, and to support the element(s) to be cut.
- B. Protection of Existing Construction During Cutting and Patching:
 1. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that will be exposed during cutting and patching operations.
 2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 3. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 CORING

- A. Core-drill holes to be cut through concrete and masonry walls, slabs, or arches, unless otherwise accepted by ENGINEER in writing.
- B. Coring:
 - 1. Perform coring with non-impact rotary tool using diamond core-drills. Size holes for pipe, conduit, sleeves, equipment or mechanical seals, as required, to be installed through the penetration.
 - 2. Do not core-drill through electrical conduit or other utility lines embedded in walls or slabs without approval of ENGINEER. To extent possible, avoid cutting reinforcing steel in slabs and walls.
- C. Protection:
 - 1. Protect existing equipment, utilities, and adjacent areas from water and other damage covered by core-drilling operations.
 - 2. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.
- D. Cleaning:
 - 1. Vacuum or otherwise remove slurry and tailings from the work area following core-drilling.

3.5 CUTTING

- A. Cutting – General:
 - 1. Cut existing construction using methods least likely to damage elements retained or adjoining construction, and that provide proper surfaces to receive installation or repair.
 - 2. In general, use hand or small power tools suitable for sawing or grinding. Avoid using hammering and chopping when possible.
 - 3. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces.
 - 4. Provide adequate bracing of area to be cut prior to start of cutting.
 - 5. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed side.
 - 6. Provide equipment of adequate size to remove cut panel.
 - 7. Provide temporary covering over cut openings where not in use.
- B. Cutting – Concrete and Masonry:
 - 1. Cut through concrete and masonry using concrete wall saw with diamond saw blades.
 - 2. On both the element being cut, provide for control of slurry generated during sawing.

3. After cutting concrete and before installing subsequent construction on or through the opening, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

3.6 PATCHING

A. Patching – General:

1. Patch construction by filling, repairing, refinishing, closing-up, and similar operations following performance of other Work.
2. Patch with durable seams that are as inconspicuous as possible. Provide materials and comply with installation requirements indicated in the Contract Documents.
3. Patch to provide airtight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
4. Where feasible, test patched areas to demonstrate integrity of installation.

B. Restoration:

1. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that eliminates evidence of patching and refinishing.
2. For continuous surfaces, refinish to nearest intersection.
3. For an assembly, refinish the entire unit that was patched.
4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 CLEANING

A. Cleaning and Restoration:

1. Clean areas and spaces where cutting, coring, or patching were performed.
2. Clean piping, conduit, and similar constructions before applying paint or other finishing materials.
3. Restore damaged coverings of pipe and other utilities to original condition.

+ + END OF SECTION + +

SECTION 02 41 00

DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required for demolition, removal, and disposal Work.
2. The Work under this Section includes, but is not necessarily limited to:
 - a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes specific demolition of concrete, masonry, manholes, miscellaneous metals, paving, fencing and similar existing facilities.
3. Demolitions and removals specified under other Sections shall comply with requirements of this Section.
4. Perform demolition Work within areas shown or indicated.
5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition.

B. Coordination:

1. Comply with Section 01 41 16, Coordination with Owner's Operations.
2. Review procedures under this and other Sections and coordinate the Work that will be performed with or before demolition and removals.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.

B. Regulatory Requirements:

1. Demolition, removal, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T - Demolition), and all other Laws and Regulations.
2. Comply with requirements of authorities having jurisdiction.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Procedure Submittals:

- a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:
 - 1) Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.
2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

- A. Notification:
 1. At least 48 hours prior to commencing demolition or removal, notify ENGINEER in writing of planned start of demolition Work. Do not start removals without permission of ENGINEER.
- B. Protection of Surrounding Areas and Facilities:
 1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.
 2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
 3. Provide temporary barriers, lighting, sidewalk sheds, and other necessary protection.
 4. Repair damage to facilities that are to remain.
- C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, do the following:
 1. Should uncharted or incorrectly charted Underground Facilities be encountered, CONTRACTOR responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.
 - 2.. Other Utilities: Before proceeding with demolition, locate and cap as required all other utilities, such as fuel and gas; heating, ventilating, and air conditioning; electric; and communications; and service laterals serving the building or structure being demolished.
 3. Shutdown of utility services shall be coordinated by CONTRACTOR, assisted by OWNER as required relative to contacting utility owners.

3.2 DEMOLITION – GENERAL

- A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.
- B. Pollution Controls:
 - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05, Temporary Controls, and Laws and Regulations.
 - 2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
 - 3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions.
- C. Demolition of Site Improvements:
 - 1. Pavement, Sidewalks, Curbs, and Gutters: Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
 - 2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.
 - 3. Manholes, Vaults, Chambers, and Handholes: Remove to the limits shown or indicated on the Drawings.
- D. Salvage and Ownership:
 - 1. Refer to Section 01 11 13 Summary of Work, for requirements on salvage, ownership, and handling of equipment and materials removed during demolition and removal Work.
 - 2. Materials and equipment to remain OWNER's property shall be carefully removed and appropriately handled by CONTRACTOR to avoid damage and invalidation of warranties in effect, and shall be cleaned and stored at the Site (or other site specified in the Contract Documents) at place designated by ENGINEER or OWNER.
- E. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by ENGINEER.
- F. Recycling and Reuse of Demolition Materials:
 - 1. All concrete, brick, tile, masonry, roofing materials, reinforcing steel, structural metals, miscellaneous metals, plaster, wire mesh, and other items contained in or upon building or structure to be demolished shall be removed, transported, and disposed of away from the Site, unless otherwise approved by ENGINEER.
 - 2. Do not use demolished materials as fill or backfill adjacent to structures, in pipeline trenches, or as sub-base under structures or pavement.

- G. After removing concrete and masonry walls or portions thereof, slabs, and similar construction that ties in to the Work or to existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.
- H. Where parts of existing structures are to remain in service following demolition, remove the portions shown or indicated for removal, repair damage, and leave the building or structure in proper condition for the intended use.
 - 1. Remove concrete and masonry to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended.
 - 2. Do not damage reinforcing bars beyond the area of concrete and masonry removal. Do not saw-cut beyond the area to be removed.
 - 3. Reinforcing bars that are exposed at surfaces of removed concrete and masonry that will not be covered with new concrete or masonry shall be removed to 1.5 inches below the final surface. Repair the resulting hole, with repair mortar for concrete and grout for masonry, to be flush with the surface.
 - 4. Where existing reinforcing bars are shown or indicated to extend into new construction, remove existing concrete so that reinforcing bars are clean and undamaged.
- I. Where equipment or material anchored to concrete or masonry are removed and anchors are not to be re-used, remove the anchors to not less than 1.5 inches beneath surface of concrete or masonry member. Repair the resulting hole, using repair mortar for concrete and grout for masonry, to be flush with the surface. Alternately, when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete or masonry, when so approved by ENGINEER.
- J. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Section, unless specified elsewhere in the Contract Documents.

3.3 ELECTRICAL REMOVALS

- A. Electrical demolition Work includes removing existing transformers, distribution switchboards, control panels, motors, starters, conduit and raceways, cabling, poles and overhead cabling, panelboards, lighting fixtures, switches, and miscellaneous electrical equipment, as shown, specified, or required.
- B. Remove existing electrical equipment and fixtures to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.
- C. Remove or modify motor control centers and switchgear as shown or indicated. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.

- D. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated. Motors, microprocessors and electronics, other electrical gear to be reused shall be stored inside and protected from dust, dirt, debris and moisture.
- E. Cables in conduits to be removed shall be removed back to the power source or control panel, unless otherwise shown or indicated. Verify the function of each cable before disconnecting and removing.
- F. Conduits, raceways, and cabling shall be removed where shown or indicated. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to ENGINEER. Exposed conduits, junction boxes, other electrical appurtenances, and their supports shall be disassembled and removed. Repair all areas of the Work to prevent rusting on exposed surfaces.
- G. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.
- H. Where shown or indicated, remove direct burial cable. Openings in buildings for entrance of direct burial cable shall be patched with repair mortar or other material approved by ENGINEER for this purpose, and made watertight.
- I. Existing poles and overhead cables shall be removed or abandoned as shown and specified. Existing substation(s) and poles owned by electric utility will be removed by the electric utility. Completely remove from the Site poles not owned by electric utility and shown or indicated for removal. Make necessary arrangements with electric utility for removal of utility company's transformers and metering equipment after new electrical system has been installed and energized.
- J. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as OWNER's property, shall be removed and properly disposed off-Site as required.

3.4 DISPOSAL OF DEMOLITION DEBRIS

- A. Remove from the Site all debris, waste, rubbish, and material resulting from demolition operations and equipment used in demolition Work. Comply with the General Conditions and Supplementary Conditions.
- B. Transportation and Disposal:
 - 1. Non-hazardous Material: Properly transport and dispose of non-hazardous demolition debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.

2. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with the Contract Documents and Laws and Regulations.
- C. Submit to ENGINEER information required in this Section on proposed facility(ies) where demolition material will be recycled. Upon request, ENGINEER or OWNER, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist ENGINEER and OWNER.

+ + END OF SECTION + +

SECTION 03 00 05

CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to remove existing concrete as well as furnish and install concrete, reinforcing, and related materials.
2. The Work includes:
 - a. Providing concrete consisting of portland cement, fine and coarse aggregates, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured.
 - b. Fabricating and placing reinforcing, including ties and supports.
 - c. Design, erection, and removal of formwork.
 - d. Building into the concrete all sleeves, frames, anchorage devices, inserts, and other items required to be embedded in concrete.
 - e. Providing openings in concrete as required to accommodate Work under this and other Sections.
 - f. Removing existing concrete as needed to accommodate Work under this and other Sections.

B. Coordination:

1. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.

C. Classifications of Concrete:

1. Class “A” concrete shall be steel-reinforced and includes all concrete unless otherwise shown or indicated.
2. Class “B” concrete shall be placed without forms or with simple forms, with little or no reinforcing and includes the following:
 - a. Concrete fill.
 - b. Duct banks.
 - c. Unreinforced encasements.
 - d. Curbs and gutters.
 - e. Sidewalks.
 - f. Thrust blocks.

D. Related Sections:

1. Section 05 05 33, Anchor Systems.
2. Section 33 05 13, Manholes and Structures.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ACI 224R, Control of Cracking in Concrete Structures.
2. ACI 301, Specifications for Structural Concrete for Buildings.
3. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
4. ACI 305R, Specification for Hot Weather Concreting.
5. ACI 306R, Cold Weather Concreting.
6. ACI 309R, Guide for Consolidation of Concrete.
7. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
8. ACI 347, Guide to Formwork for Concrete.
9. ACI SP-66, ACI Detailing Manual.
10. ASTM A82/A82M, Specification for Steel Wire, Plain, for Concrete Reinforcement.
11. ASTM A185/A185M, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
12. ASTM A615/A615M, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
13. ASTM C31/C31M, Practice for Making and Curing Concrete Test Specimens in the Field.
14. ASTM C33/C33M, Specification for Concrete Aggregates.
15. ASTM C39/C39M, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
16. ASTM C42/C42M, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
16. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
17. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
18. ASTM C143/C143M, Test Method for Slump of Hydraulic-Cement Concrete.
19. ASTM C150/C150M, Specification for Portland Cement.
20. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
21. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
22. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
23. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
24. ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
25. ASTM C579, Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
26. ASTM C1064/C1064M, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
27. ASTM D1752, Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
28. ASTM E96/E96M, Test Methods for Water Vapor Transmission of Materials
29. ASTM E154, Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

30. CRD-C 572, U. S. Army Corps of Engineers Specification for Polyvinylchloride Waterstops.
31. CRSI 1MSP, Manual of Standard Practice.

1.3 QUALITY ASSURANCE

- A. Certification Statement
 1. Provide written certification statement assuring the quality of the concrete meets or exceeds the requirements of this specification Section.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Shop Drawings:
 - a. List of concrete materials and concrete mix designs proposed for use. Include results of tests performed to qualify the materials and to establish the mix designs. Do not start laboratory trial batch testing until this submittal is approved by ENGINEER.
 - b. Laboratory Trial Batch Reports: Submit laboratory test reports for concrete cylinders, materials, and mix design tests.
 2. Product Data:
 - a. Manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
- B. Informational Submittals: Submit the following:
 1. Delivery Tickets: Copies of all delivery tickets for each load of concrete delivered to or mixed at the Site. Each delivery tickets shall contain the information in accordance with ASTM C94/C94M along with project identification name and number (if any), date, mix type, mix time, quantity and amount of water introduced.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Transportation, Delivery, and Handling:
 1. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.
 2. Materials used for concrete shall be clean and free from foreign matter during transportation and handling, and kept separate until measured and placed into concrete mixer.
 3. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur and grading is not affected.
 4. Deliver grout materials from manufacturers in unopened containers that bear intact manufacturer labeling.

B. Storage:

1. Store formwork materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof covering. Provide for adequate air circulation or ventilation under cover.
2. Store concrete reinforcing materials to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground. Space framework or blocking supports to prevent excessive deformation of stored materials.
3. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight.
4. For storage of concrete materials, provide bins or platforms with hard, clean surfaces.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type II.

B. Aggregates: ASTM C33/C33M.

1. Fine Aggregate: Clean, sharp, natural sand free of loam, clay, lumps, and other deleterious substances. Dune sand, bank run sand, and manufactured sand are unacceptable.
2. Coarse Aggregate:
 - a. Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter.
 - b. Coarse aggregate shall comply with the following:
 - 1) Crushed stone, processed from natural rock or stone.

C. Water: Clean, potable.

D. Admixtures:

1. Air-Entraining Admixture: ASTM C260.
2. Water-Reducing Admixture: ASTM C494/C494M, Type A.
3. Water Reducing and Set-Adjusting Admixtures: ASTM C494/C494M, Types D and E.
4. High Range Water-Reducing Admixture: ASTM C494/C494M, Type F/G.
5. Use only admixtures that have been tested and approved in the mix designs.
6. Do not use calcium chloride or admixtures containing chloride ions.

2.2 CONCRETE MIX

A. General:

1. Normal weight: 145 pounds per cubic foot.
2. Use air-entraining admixture in all concrete. Provide not less than four percent, nor more than eight percent, entrained air for concrete exposed to

freezing and thawing, and provide from three to five percent entrained air for other concrete.

- B. Proportioning and Design of Class “A” Concrete Mix:
 - 1. Minimum compressive strength at 28 days: 4,500 psi.
 - 2. Maximum water-cement ratio by weight: 0.42.
 - 3. Minimum cement content: 564 pounds per cubic yard.
- C. Proportioning and Design of Class “B” Concrete Mix:
 - 1. Minimum compressive strength at 28 days: 3,000 psi.
 - 2. Maximum water-cement ratio by weight: 0.50.
 - 3. Minimum cement content: 517 pounds per cubic yard.
- D. Slump Limits:
 - 1. Proportion and design mixes to result in concrete slump at point of placement of not less than one inch and not more than four inches.
 - 2. When using high-range water reducers, slump prior to addition of admixture shall not exceed three inches. Slump after adding admixture shall not exceed eight inches at point of placement.
- E. Adjustment of Concrete Mixes:
 - 1. Concrete mix design adjustments may be requested by CONTRACTOR when warranted by characteristics of materials, Site conditions, weather, test results, or other, similar circumstances.
 - 2. Submit for ENGINEER’s approval laboratory test data for adjusted concrete mix designs, including compressive strength test results.
 - 3. Implement adjusted mix designs only after ENGINEER’s approval.
 - 4. Adjustments to concrete mix designs shall not result in additional costs to OWNER.

2.3 FORM MATERIALS

- A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection. CONTRACTOR shall be responsible for designing the formwork system to resist all applied loads including pressures from fluid concrete and construction loads.
- B. Smooth Form Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces in accordance with ACI 301.
- C. Unexposed Concrete Surfaces: Material to suit project conditions.
- D. Provide 3/4-inch chamfer at all external corners. Chamfer is not required at re-entrant corners unless otherwise shown or indicated.
- E. Form Ties:

1. Provide factory-fabricated, removable, or snap-off metal form ties, that prevent form deflection and prevent spalling of concrete surfaces upon removal. Materials used for tying forms are subject to approval of ENGINEER.
2. Unless otherwise shown or indicated, provide ties so that portion remaining within concrete after removal of exterior parts is at least 1.5 inches from outer surface of concrete. Unless otherwise shown or indicated, provide form ties that, upon removal, will leave a uniform, circular hole not larger than one-inch diameter in the concrete surface.
3. Ties for exterior walls, below-grade walls, and walls subject to hydrostatic pressure shall be provided with waterstops.
4. Wire ties are unacceptable.

2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed bars.
- B. Welded Wire Fabric: ASTM A185/A185M.
- C. Steel Wire: ASTM A82/A82M.
- D. Provide supports for reinforcing including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing in place.
 1. Use wire bar-type supports complying with CRSI MSP1 recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
 2. For slabs on grade, use precast concrete blocks, four inches square minimum with compressive strength equal to or greater than the surrounding concrete, or supports with sand plates or horizontal runners where base materials will not support chair legs.
 3. For all concrete surfaces where legs of supports are in contact with forms, provide supports having either hot-dip galvanized, plastic-protected, or stainless steel legs in accordance with CRSI MSP1.
 4. Provide precast concrete supports over waterproof membranes.
- E. Adhesive Dowels:
 1. Dowels:
 - a. Dowel reinforcing bars shall comply with ASTM A615, Grade 60.
 2. Adhesive:
 - a. For requirements for adhesive, refer to Section 05 05 33, Anchor Systems.

2.5 RELATED MATERIALS

- A. All materials are to be manufactured in North America.
- B. Waterstops:
 1. PVC Waterstops:
 - a. Manufacturers: Provide products of one of the following:
 - 1) W.R. Meadows, Inc.

- 2) Greenstreak Plastic Products Company.
 - 3) Or equal.
- b. Waterstops shall comply with CRD-C 572. Do not use reclaimed or scrap material.
- c. Minimum Thickness: 3/8-inch.
- d. Provide waterstops with minimum of seven ribs equally spaced at each end on each side with the first rib located at the edge. Each rib shall be minimum 1/8-inch in height.
- e. Construction Joints: Waterstops shall be six-inch wide flat-strip type.
- f. Expansion Joints: Waterstops shall be nine-inch wide centerbulb type.
- 2. Hydrophilic Waterstops:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Duroseal Gasket, by BBZ USA, Inc.
 - 2) Hydrotite, by Greenstreak Plastic Products Company.
 - 3) Or equal.
 - b. Hydrophilic waterstop materials shall be bentonite-free and shall expand by minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast.
 - c. Waterstop material shall be composed of resins and polymers that absorb water and cause a completely reversible and repeatable increase in volume.
 - d. Waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.
 - e. Select material in accordance with manufacturer's recommendations for type of liquid to be contained.
 - f. Minimum cross-sectional dimensions: 3/16-inch by 3/4-inch.
 - g. Location of hydrophilic waterstops shall be as shown or indicated on the Drawings, or where approved by ENGINEER.
 - h. Hydrophilic Sealant: Shall adhere firmly to concrete, metal, and PVC in dry or damp condition and be indefinitely elastic when cured.
 - 1) Products and Manufacturers: Provide one of the following:
 - a) Duroseal Paste, by BBZ USA, Inc.
 - c) Hydrotite, by Greenstreak Plastic Products Company.
 - d) Or equal.

2.6 GROUT

- A. Non-shrink Grout:
 - 1. Pre-packaged, non-metallic, cementitious grout requiring only the addition of water at the Site.
 - 2. Minimum 28-day Compressive Strength: 7,000 psi.
 - 3. Products and Manufacturers: Provide one of the following:
 - a. NS Grout by Euclid Chemical Company.
 - b. Set Grout by Master Builders, Inc.
 - c. NBEC Grout by Five Star Products, Inc.
 - d. Or equal.
- B. Epoxy Grout:

1. Pre-packaged, non-shrink, non-metallic, 100 percent solids, solvent-free, moisture-insensitive, three-component epoxy grouting system.
 2. Minimum Seven-day Compressive Strength: 14,000 psi, when tested in accordance with ASTM C579.
 3. Products and Manufacturers: Provide one of the following:
 - a. E³-X, by Euclid Chemical Company.
 - b. Sikadur 42, Grout Pak, by Sika Corporation.
 - c. HD Epoxy Grout, by Five Star Products, Inc.
 - d. Or equal.
- C. Grout Fill:
1. Grout mix shall consist of cement, fine and coarse aggregates, water, and admixtures complying with requirements specified in this Section for similar materials in concrete.
 2. Proportion and mix grout fill as follows:
 - a. Minimum Cement Content: 564 pounds per cubic yard.
 - b. Maximum Water-Cement Ratio: 0.45.
 - c. Maximum Coarse Aggregate size: 1/2-inch, unless otherwise indicated.
 - d. Minimum 28-day Compressive Strength: 4,000 psi.

PART 3 – EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine the substrate and the conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORMWORK

- A. Construct formwork in accordance with ACI 347 such that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- B. Provide openings in formwork to accommodate the Work of other trades. Accurately place and securely support items required to be built into formwork.
- C. Clean and adjust forms prior to placing concrete. Apply form release agents or wet forms as required. Re-tighten forms during and after concrete placing, when required, to eliminate cement paste leaks.
- D. Removing Formwork:
1. Comply with ACI 301 and ACI 347, except as otherwise indicated in the Contract Documents.
 2. Do not remove formwork and shoring until supported concrete members have acquired minimum of 90 percent of specified compressive strength. Results of suitable quality control tests of field-cured specimens may be submitted to

ENGINEER for review as evidence that concrete has attained sufficient strength for removal of supporting formwork and shoring prior to removal times indicated in the Contract Documents.

3. Removal time for formwork is subject to ENGINEER's acceptance.
4. Repair form tie-holes following in accordance with ACI 301.

3.3 REINFORCING, JOINTS, AND EMBEDDED ITEMS

- A. Comply with the applicable recommendations of Laws and Regulations and standards referenced in this Section, including CRSI MSP1, for details and methods of placing and supporting reinforcing.
- B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials which act to reduce or destroy bond between reinforcing material and concrete.
- C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by means of metal chairs, runners, bolsters, spacers, and hangers, as required.
 1. Place reinforcing to obtain minimum concrete coverages as shown on the Drawings and as required in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
 2. Do not secure reinforcing to formwork using wire, nails or other ferrous metal. Metal supports subject to corrosion shall not be in contact with formed or exposed concrete surfaces.
- D. Provide sufficient quantity of supports of strength required to carry reinforcing. Do not place reinforcing more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- E. Install welded wire fabric in lengths as long as practical, lapping adjoining sections a minimum of one full mesh.
- F. Do not place concrete until reinforcing is inspected and ENGINEER indicates that conditions are acceptable for placing concrete. Concrete placed in violation of this paragraph will be rejected. Notify ENGINEER in writing at least two working days prior to proposed concrete placement.
- G. Installation of Embedded Items: Set and build into the Work anchorage devices and embedded items required for other Work that is attached to, or supported by, cast-in-place concrete. Use setting diagrams, templates, and instructions provided under other Sections and, when applicable, other contracts for locating and setting. Refer to Paragraph 1.1.B of this Section. Do not embed in concrete uncoated aluminum items. Where aluminum items are in contact with concrete surfaces, coat aluminum to prevent direct contact with concrete.

H. Adhesive Dowels:

1. Adhesive dowels shall be reinforcing bar dowels set in an adhesive in hole drilled into hardened concrete. Comply with adhesive system manufacturer's installation instructions regarding hole diameter, drilling method, embedment depth required to fully develop required tensile strength, and hole cleaning and preparation instructions. Unless more-stringent standards are required by adhesive system manufacturer, comply with the following.
2. Drill holes to adhesive system manufacturer's recommended diameter and depth to develop required tensile strength. Holes shall not be more than 1/4-inch greater than nominal bar diameter, and hole depth shall not be less than twelve times nominal bar diameter. Hammer-drill holes. Cored holes are not allowed.
3. Embedment depths shall be based on concrete compressive strength of 2,000 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.
4. Determine location of existing reinforcing steel in vicinity of proposed holes prior to drilling. Adjust location of holes to be drilled to avoid drilling through or damaging existing reinforcing bars only when approved by ENGINEER.
5. Before setting adhesive dowel, hole shall be free of dust and debris using method recommended by adhesive system manufacturer. Hole shall be brushed, with manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
6. Inject adhesive into hole through injection system mixing nozzle and necessary extension tubes, placed to bottom of hole. Withdraw discharge end as adhesive is placed, but keep end of tube immersed to prevent forming air pockets. Fill hole to depth that ensures that excess material is expelled from hole during dowel placement.
7. Twist dowels during insertion into partially-filled hole to guarantee full wetting of bar surface with adhesive. Insert bar slowly to avoid developing air pockets.

3.4 CONCRETE PLACING

- A. Site Mixing: Use drum-type batch machine mixer, mixing not less than 1.5 minutes for one cubic yard or smaller capacity. Increase required mixing time by minimum of 15 seconds for each additional cubic yard or fraction thereof.
- B. Ready-Mixed Concrete: Comply with ASTM C94/C94M.
- C. Concrete Placing:
 1. Place concrete in a continuous operation within planned joints or sections in accordance with ACI 304R.
 2. Do not begin placing concrete until work of other trades affecting concrete is completed.
 3. Wet concrete and subgrade surfaces to saturated surface dry condition immediately prior to placing concrete.

4. Deposit concrete as near its final location as practical to avoid segregation due to re-handling or flowing.
 5. Avoid separation of the concrete mixture during transportation and placing. Concrete shall not free-fall for distance greater than four feet during placing.
 6. Complete concrete placing within 90 minutes of addition of water to the dry ingredients.
- D. Consolidate placed concrete in accordance with ACI 309R using mechanical vibrating equipment supplemented with hand rodding and tamping, such that concrete is worked around placing and other embedded items and into all parts of formwork. Insert and withdraw vibrators vertically at uniformly-spaced locations. Do not use vibrators to transport concrete within the formwork. Vibration of formwork or placing is not allowed.
- E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
1. In hot weather comply with ACI 305R.
 2. In cold weather comply with ACI 306R.

3.5 QUALITY OF CONCRETE WORK

- A. Make concrete solid, compact, smooth, and free of laitance, cracks, and cold joints.
- B. Concrete for liquid-retaining structures and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
- C. Cut out and properly replace to extent directed by ENGINEER, or repair to satisfaction of ENGINEER, surfaces that contain cracks or voids, are unduly rough, or are in defective in any way. Patches or plastering are unacceptable.
- D. Repair, removal and replacement of defective concrete directed by ENGINEER shall be at no additional cost to OWNER.

3.6 CURING

- A. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by using moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until formwork is removed. Provide protection, as required, to prevent damage to exposed concrete surfaces. Total curing period shall not be less than seven days. Curing methods and materials shall be compatible with scheduled finishes.

3.7 FINISHING

- A. Slab Finish:
1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when surface water has disappeared or when concrete

has stiffened sufficiently. Use a wood float only. Check and level surface plane to a tolerance not exceeding 1/4-inch in ten feet when tested with a ten foot straightedge placed on the surface at not less than two different angles. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float the surface to a uniform, smooth, granular texture. Slab surfaces shall receive a float finish. Provide additional trowel finishing as required in this Section.

2. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over the surface.
3. Consolidate concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8-inch in ten feet when tested with a ten-foot straightedge. Grind smooth surface defects that would telegraph through applied floor covering system.
4. Use trowel finish for the following:
 - a. Interior exposed slabs, unless otherwise shown or indicated.
 - b. Apply non-slip broom finish, after troweling, to exterior concrete slab and elsewhere as shown.

C. Formed Finish:

1. Provide smooth form concrete finish at exposed surfaces. Use largest practical form panel sizes to minimize form joints. Exposed surfaces include interior water-contacting surfaces of tanks, whether or not directly visible. All surfaces shall be considered as exposed, unless buried or covered with permanent structural or architectural material. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/8-inch in height. Where surface will be coated or will receive further treatment, remove all fins flush with concrete surface.
2. Provide rough form finish at all unexposed surfaces. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/2-inch in height.

3.8 DEMOLITION

A. Concrete Removal:

1. CONTRACTOR shall remove existing concrete and reinforcing to accommodate the Work.
2. Removal may be performed by saw-cutting sections only.
3. CONTRACTOR is responsible for proper disposal of removed concrete and miscellaneous debris.

+ + END OF SECTION + +

SECTION 03 01 31

CONCRETE AND MASONRY REPAIR

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment and incidentals as shown, specified and required to repair or rehabilitate all existing concrete and masonry structures, pipelines, and surfaces identified in the contract and as directed by the ENGINEER.
2. Repair all damage to new concrete construction as specified herein.
3. Perform Post Construction Inspections of all rehabilitated pipelines in accordance with Section 33 01 30.16, Television Inspection of Sewers.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be included with the repair and rehabilitation of concrete and masonry.

C. Related Sections:

1. Section 33 01 30.16, Television Inspection of Sewers.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. American Society for Testing and Materials, (ASTM).
 - a. ASTM C 109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
 - b. ASTM C 157, Standard Test Method for Length Change of Hardened Cement Mortar and Concrete.
 - c. ASTM C 293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center Point Loading).
 - d. ASTM C 307, Standard Test Method for Tensile Strength of Chemical Resistant Mortar, Grouts and Monolithic Surfacing.
 - e. ASTM C 882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete.
 - f. ASTM D 412, Standard Test Methods for Vulcanized and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.

- g. ASTM C 496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
- h. ASTM D 624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- i. ASTM D 638, Standard Test Method for Tensile Properties of Plastic.
- j. ASTM D 732, Standard Test Method for Shear Strength of Plastics by Punch Tool.
- k. ASTM D 903, Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- l. ASTM G 109, Standard Test Method for Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments.

1.3 DEFINITIONS

NOT USED

1.4 QUALITY ASSURANCE

- A. Construction Tolerances: Construction tolerances shall be as specified.

1.5 SUBMITTALS

- A. Shop Drawings: Submit the following:
 - 1. CONTRACTOR shall submit manufacturer's product information and recommended placement procedures for all repair materials.
 - 2. CONTRACTOR shall submit Shop Drawings, when requested by ENGINEER, to show all methods for supporting existing structures, pipes, etc., during demolition and repair activities.

1.6 QUALIFICATIONS

- A. CONTRACTOR shall be licensed and certified by the manufacturer of the manhole monolithic lining process. CONTRACTOR shall have completed monolithic lining of at least 30 manholes.
- B. All work must be supervised by a foreman responsible for rehabilitating a minimum of 10 manholes using the proposed manufacturer's fiber reinforced cementitious manhole lining process.
- C. CONTRACTOR shall be licensed and certified by the manufacturer of the injection grouting process. CONTRACTOR shall have performed injection grouting on a minimum of 10 manholes.

- D. All injection grouting work must be supervised by a foreman responsible for rehabilitating a minimum of 10 manholes using the proposed manufacturer's injection grouting process.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:

- 1. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information.
 - a. Name or title of material.
 - b. Manufacturer's stock number and date of manufacture.
 - c. Manufacturer's name.

B. Handling of Materials:

- 1. Handle materials carefully to prevent inclusion of foreign materials.
- 2. Do not open containers or mix components until necessary preparatory Work has been completed and application Work will start immediately.

1.8 GUARANTEE

- A. General Warranty: The special warranty specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.
- B. Special Warranty on Materials and Equipment:
 - 1. All manhole repairs or rehabilitation shall be guaranteed by the CONTRACTOR against infiltration, spalling, loss of adhesion or failure for a period of 5 years from the date of completion of the Work. During this period, all defects shall be repaired by CONTRACTOR in a manner satisfactory to the ENGINEER at no additional compensation.
- C. The CONTRACTOR shall bear all costs incurred by the manufacturer, including travel and expenses, under the terms of the warranty.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Handling, formulation, and storage of the sealing compounds and grouts shall be in strict conformance with the manufacturer's recommendations. The uncured

compound and grouts shall be delivered to the Site in unopened containers, with the date of manufacture clearly indicated. Any uncured compound determined to be more than six months old shall not be used. Once a container of uncured compound or grout has been opened it shall be used within 24 hours of being opened. Unused compound/grout shall be disposed of after 24 hours of being opened at no additional cost to the OWNER.

- B. Mixing and handling of the compounds and grouts shall be as recommended by the manufacturer. The CONTRACTOR is responsible for minimizing hazard to personnel by providing appropriate protective measures to ensure that the components and the chemicals produced in mixing are under the control of the CONTRACTOR at all times and are not available to unauthorized personnel or others. Excess material resulting from rehabilitation operations shall be disposed of in a safe manner. All equipment and material shall be subject to the review of the ENGINEER.
- C. All chemical materials used shall meet the following minimum application requirements:
 - 1. All component materials shall be easily transportable by common carriers.
 - 2. Packing of component materials shall be compatible with field storage requirements.
 - 3. Components shall be packed in such a fashion as to provide for maximum worker safety when handling the materials and minimize spillage when preparing for use.
 - 4. Mixing of the components shall be compatible with field applications, not require precise measurements, and be within the limits recommended by the manufacturer.
 - 5. Catalyzation shall take place at the point of injection/repair.
 - 6. Cleanup shall be done without inordinate use of flammable or hazardous chemicals.
 - 7. Residual sealing materials shall be removed from the sewer after injection to ensure no flow reductions restriction or blockage of sewer flows.

2.2 FRACTURE REPAIR PRODUCTS

- A. For fractures less than 1/4-inch in width: The caulk shall consist of 100% solids, moisture tolerant, high modulus, high strength, structural epoxy. The fracture repair system shall have the following properties:

Physical Property	Value	ASTM Standard
Tensile Properties at 14 days		D 638

Tensile Strength:	4700 psi	
Elongation at Break:	1.2%	
Modulus of Elasticity:	1.2 x 10 ⁵ psi	
Shear Strength at 7 days	4900 psi	D 732

1. USADA and NSF approved for potable water contact.
 2. When recommended by the manufacture of the fracture repair system apply primer, corrosion inhibitors or other preparatory materials in accordance with manufacturer's recommendations.
 3. Products and Manufacturers: Provide the following:
 - a. Sikadur AnchorFix-3, as manufactured by Sika Corporation or equal.
 - b. Planitop 11, as manufactured by MAPEI or equal.
 - c. EMACO Nanocrete, as manufactured by BASF or equal.
- B. For fractures less than 1/2-inch in width: The caulk shall consist of polyurethane, elastomeric sealant/adhesive. The fracture repair system shall have the following properties:

Physical Property	Value	ASTM Standard
Tensile Properties at 21 days		D 412
Tensile Stress:	200 psi	
Elongation at Break:	500%	
Tear Strength at 7 days	50 lb./in.	D 624

1. When recommended by the manufacture of the fracture repair system, apply primer, corrosion inhibitors or other preparatory materials in accordance with manufacturer's recommendations.
 2. Products and Manufacturers: Provide the following:
 - a. Sikaflex-1A, as manufactured by Sika Corporation or equal.
 - b. Sikaflex429, as manufactured by Sika Corporation or equal.
- C. For fractures/fractures greater than 1/2-inch in width and less than 2-inches in depth: mortar shall be a prepackaged cement based product specifically formulated for the repair of concrete surface defects. The repair mortar shall be a two-component polymer-modified, Portland cement, fast setting, trowel-grade mortar. The mortar shall be enhanced with a penetrating corrosion inhibitor and shall have the following properties:

Physical Property	Value	ASTM Standard
Compressive Strength (minimum)		C 109
at 1 day:	2000 psi	
at 28 days:	6000 psi	
Physical Property	Value	ASTM Standard
Bond Strength (minimum)		C 882*
at 28 days:	1800 psi	

* Modified for use with repair mortars.

1. Where the least dimension of the placement in width or thickness, exceeds 4- inches, the repair mortar shall be extended by addition of aggregate as recommended by the manufacturer.
2. Products and Manufacturers: Provide one of the following:
 - a. SikaTop 123 Plus, as manufactured by Sika Corporation, or equal.
- D. For voids and fractures greater than 1/2-inch in width and greater than 2-inches in depth.
 1. Voids greater than 2-inches in depth shall be filled with structural grout to within two-inches of the finished surface.
 - a. The grout shall be a non-shrink, non-metallic, non-chloride cementitious grout having the following properties:

Physical Property	Value	ASTM Standard
Compressive Strength (minimum)		C 621
at 1 day:	3500 psi	
at 28 days:	6200 psi	
Bond Strength (minimum)		C 882*
at 28 days:	1900 psi	
Flexural Strength (minimum)		C 293
At 28 days:	1200 psi	

* Modified for use with repair mortars.

- b. Where the least dimension of the placement in width or thickness, exceeds 4- inches, the repair mortar shall be extended by addition of aggregate as recommended by the manufacturer.

- c. Products and Manufacturers: SikaGrout 212, as manufactured by Sika Corporation, or equal.
- 2. Following application of grout, use repair mortar specified in 2.1.C above to finish repair.
- E. Swelling waterstop: One part polyurethane, extrudable swelling waterstop (bentonite-free) able to swell up to 100% in potable water.
 - 1. SikaSwell S-2, as manufactured by Sika Corporation, or equal.

2.3 EXPOSED REBAR REPAIR

- A. The exposed reinforcing repair system shall consist of two components, a first application of a corrosion inhibitor and then a final application of a protective slurry mortar.
- B. Corrosion Inhibitor:
 - 1. The corrosion inhibitor shall penetrate the hardened concrete surface and form a protective layer on the reinforcement. It shall have the following properties:
 - a. The product shall not change the substrate's color, appearance, or texture.
 - b. Penetration (SNMS Analysis): 1/10 to 4/5 inches/day.
 - c. Coating thickness (XPS and SIMS Analysis): 100 to 1000 angstroms.
 - d. Corrosion Current Reduction (ASTM G 109): 65 percent at one year.
 - e. Chloride Displacement (XPS and SIMS Analysis): Passes.
 - f. Effectiveness in Carbonated Conditions (Electrochemical): Passes.
 - g. The product must not form a vapor barrier.
 - h. The product must be environmentally sound.
 - i. Post-application verification (Chromatography Plate Test): Passes.
 - j. Longevity (Ten Year Accelerated Weather Testing): Passes.
 - 2. Products and Manufacturers: Provide one of the following:
 - a. Sika FerroGard 903, as manufactured by Sika Corporation.
 - b. Or equal.

2.4 SEALANT ACCESSORIES

- A. Backer Rod: Backer rod shall be an extruded closed-cell polyethylene foam rod. The material shall be compatible with the sealant material used and shall have a

- tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width at joints less than 3/4-inch wide and 1/4-inch larger in diameter at joints 3/4-inch and wider.
- B. Bond Breaker Tape: Bond breaker shall be polyethylene or TFE-fluorocarbon self-adhesive tape, as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine areas and conditions under which the repair Work is to be installed and notify ENGINEER, in writing, of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 CLEANING / PREPARATION

- A. Inset plywood mats or sheeting over the existing flow channel and bench to prevent debris from falling into the sewer and to collect debris from manhole bench.
- B. Ensure all sub-surfaces are clean and free of laitance or loose material. All loose, broken, softened, and acid contaminated concrete shall be removed by abrasive blasting and chipping down to sound, uncontaminated concrete.
- C. Prepare fractures less than 1/2" in width in accordance with the standard detail. Install closed cell backer rod as directed by the ENGINEER.
- D. Remove all material that has been loosened as a result of surface preparation procedures using a brush and or vacuum prior to the application of primers, sealants, mortar, or grout.
- E. Clean bench/invert floor and interior walls of manholes and pipelines by removing deleterious material, including dirt, grease, and other debris. Use high-pressure water, at a minimum force of 3,500 psi. If required, use approved cleaners to remove grease, oil, and other matter, which would prevent a good bond between existing manhole wall and the approved repair materials.
- F. Preparation of the interior surfaces shall conform to requirements of the wall liner material or chimney seal manufacturer. Loose and protruding brick, mortar and concrete shall be removed using a mason's hammer and chisel and/or scrapper or other device as approved by the ENGINEER.

- G. Ensure that overhead sub-surfaces have been prepared to a minimum degree of roughness designated as CSP 4 by the International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- H. Ensure that sub-surfaces other than overhead have been prepared to a minimum degree of roughness designated as CSP 3 by the International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

3.3 REPAIR MORTAR PLACEMENT

- A. The procedures recommended by the manufacturer for the mixing and placement of the repair mortar shall be followed.
- B. After the initial mixing of the repair mortar, additional water shall not be added to change the consistency should the mix begin to stiffen.
- C. Repair mortar shall be placed to a minimum thickness as recommended by the manufacturer, but not less than 1/2-inch. Where removal of deteriorated concrete results in a repair thickness of less than 1/2-inch to return to original concrete surface location in isolated areas totaling less than ten percent of the total repair area, additional concrete shall be removed to obtain the 1/2-inch thickness. Where the area with repair thickness of less than 1/2-inch exceeds ten percent of the total repair area, notify the ENGINEER. CONTRACTOR shall not place repair mortar so as to create locally raised areas. Where there is a transition with wall surfaces which are not in need of repair, the repair mortar shall not be feathered at the transition. A score line shall be sawcut to not less than the minimum repair mortar depth and concrete chipped out to it to form the transition. Care shall be taken to not cut or otherwise damage any reinforcing steel.
- D. The repair mortar shall be placed to an even, uniform plane to restore the member to its original surface. Tolerance for being out of plane shall be such that the gap between a 12-inch straight edge and the repair mortar surface does not exceed 1/4-inch and the gap between a 48-inch straight edge and the repair mortar surface does not exceed 1/4-inch. This shall apply to straight edges placed in any orientation at any location.

3.4 REPAIR MORTAR FINISHING

- A. The repair mortar shall receive a smooth, steel trowel finish.
- B. When completed, there shall be no sharp edges. All exterior corners, such as at penetrations, shall be made with a 1-inch radius. All interior corners shall be square.

3.5 REPAIR MORTAR CURING

- A. Curing shall be performed as recommended by the repair mortar manufacturer, except that the cure period shall be at least 24 hours and shall be by means of a continuous fog spray. If the manufacturer recommends the use of a curing compound, no material shall be used that would interfere with the bond of the protective coating system.

3.6 EXPOSED REBAR REPAIR

- A. The entire area to be repaired shall have all corrosion, foreign materials, and unsound concrete by means of abrasive blasting or hydroblasting.
- B. Surface shall be visually dry before application of the corrosion inhibitor. The corrosion inhibitor shall be placed liberally to achieve 100 sq ft/gal coverage in two or more coats by allowing it to soak into the substrate. The re-coat time between coats shall be a minimum of one hour or as recommended by the manufacturer. Apply by use of rollers, brushes, or hand-pressure spray equipment.
- C. After the last coat of the corrosion inhibitor is applied, a minimum curing time of 24 hours is required.
- D. High pressure wash all surfaces to remove filmy residue that is left on the surface by the corrosion inhibitor. Residue acts like bond breaker and must be removed before mortar coating.

3.7 RE-ATTACHMENT OF TOP SLAB

- A. After surface preparation, bring walls to grade as required to obtain finished elevation when the top slab is re-attached.
- B. Use hydraulic cement as specified in this Section and finish the perimeter of the bottom side of the top slab and the top of all walls to provide a flat and level surface to accept re-attachment of the top slab.
- C. Apply layer of hydraulic cement and place top slab squarely on the structure. Point any voids, gaps or spaces using hydraulic cement.

3.8 CLEANUP

- A. Remove all debris from the manhole.
- B. If debris from CONTRACTOR'S work has entered the sewer pipe, the CONTRACTOR shall clean the affected pipe(s) to the satisfaction of the ENGINEER and at no additional cost to the OWNER.

+ + END OF SECTION + +

SECTION 05 05 33

ANCHOR SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
 - 2. This Section includes all anchor systems required for the Work, but not specified under other Sections.
- B. Coordination:
 - 1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.2 REFERENCES

- A. Standards referenced in this Section are:
 - 1. ACI 318, Building Code Requirements for Structural Concrete.
 - 2. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
 - 3. ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
 - 4. ANSI B212.15, Cutting Tools - Carbide-tipped Masonry Drills And Blanks For Carbide-tipped Masonry Drills.
 - 5. ANSI/MSS SP-58, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.
 - 6. ASTM A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - 7. ASTM A276, Specification for Stainless Steel Bars and Shapes.
 - 8. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
 - 9. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
 - 10. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - 11. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 12. ASTM C307, Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 13. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.

14. ASTM C881/C881M, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
15. ASTM D695, Test Method for Compressive Properties of Rigid Plastics.
16. ASTM D790, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
17. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
18. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
19. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
20. ASTM F594, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
21. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
22. FS A-A-1922A, Shield, Expansion (Caulking Anchors, Single Lead).
23. FS A-A-1923A, Concrete Expansion Anchors.
24. FS A-A-1925A, Shield, Expansion (Nail Anchors).
25. FS A-A-55614, Shield, Expansion (non-drilling expansion anchors).
26. ICC-ES AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
27. ICC-ES AC58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
28. ICC-ES AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
29. ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
30. ISO 3506-1, Mechanical Properties of Corrosion-Resistant Stainless Steel Fasteners -- Part 1: Bolts, Screws and Studs.
31. NSF/ANSI 61, Drinking Water System Components – Health Effects.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Shop Drawings:
 - a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Project, and embedded lengths.
 2. Product Data:
 - a. Manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
 - b. When required by ENGINEER, copies of valid ICC ES reports that presents load-carrying capacities and installation requirements for anchor systems.

- B. Informational Submittals: Submit the following:
1. Manufacturer's Instructions:
 - a. Installation instructions for each anchor system product proposed for use, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).

1.4 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection:
1. Keep materials dry during delivery and storage.
 2. Store adhesive materials within manufacturer's recommended storage temperature range.
 3. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. General:
1. At locations where conditions dictate that Work specified in other Sections is to be of corrosion resistant materials, provide associated anchor systems of stainless steel materials, unless other corrosion-resistant anchor system material is specified. Provide anchor systems of stainless steel materials where stainless steel materials are required in the Contract Documents.
 2. Stainless Steel Nuts:
 - a. For anchor bolts and adhesive anchors, provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts for stainless steel anchors used for anchoring equipment, gates, and weirs, and other locations, if any, where the attachment will require future removal for operation or maintenance. Provide lock washer or double nuts on each anchorage device provided for equipment, as required by equipment manufacturer.
 - b. For other locations, provide for each anchorage device a nut as specified or as required by anchor manufacturer. When ASTM A194/A194M, Grade 8S (Nitronic 60) nuts are not required for anchor bolts and adhesive anchors as specified in this Section, provide anti-seizing compound where stainless steel rods are used with stainless steel nuts of the same type.
- B. Design Criteria
1. Size, Length, and Load-carrying Capacity: Comply with the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated, provide the following:

- a. Anchor Bolts: Provide size, length, and capacity required to carry design load based on values and requirements of Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor bolt embedment as shown or indicated in Paragraph 3.2.A of this Section apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.
- b. Adhesive Anchors, Expansion Anchors, or Concrete Inserts: Provide size, length, type, and capacity required to carry design load. Anchor capacity shall be based on the procedures required by the building code in effect at the Site. Where Evaluation Service Reports issued by the ICC Evaluation Service are required in this Section, anchor capacities shall be based on design procedure required in the applicable ICC Evaluation Service Report.
 - 1) General: Determine capacity considering reductions due to installation and inspection procedures, embedment length, strength of base fastening materials, spacing, and edge distance, as indicated in the manufacturer's design guidelines. For capacity determination, concrete shall be assumed to be in the cracked condition, unless calculations demonstrate that the anchor system will be installed in an area that is not expected to crack under any and all conditions of design loading.
 - 2) Concrete Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of the greater of the following: required to develop tensile strength of anchor, or a minimum embedment of 10 anchor diameters; and minimum anchor spacing and edge distance of 12 anchor diameters.
 - 3) Concrete Masonry Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
 - 4) Concrete Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of six anchor diameters, and minimum anchor spacing and edge distance of seven anchor diameters.
 - 5) Concrete Masonry Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
 - 6) Concrete Undercut Anchors: Unless otherwise shown or indicated in the Contract Documents, or approved by ENGINEER, provide minimum anchor spacing and edge distance as tabulated in anchor manufacturer's instructions.
- 2. Design Loads. Comply with the Contract Documents. When design load of supported material, equipment, or system is not otherwise shown or indicated, provide the following:

- a. Equipment Anchors: Use design load recommended by equipment manufacturer. When equipment can be filled with fluid, use loads that incorporate equipment load and load imposed by fluid.
- b. Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.
- c. Hangers and Supports for Electrical Systems, and HVAC, Plumbing, and Fire Suppression Systems and Piping: Use the full weight of supported system that is tributary to the support plus the full weight of accessories located between the hanger or support being anchored and the next hanger or support. When piping or equipment is to be filled with fluid, anchor systems shall be sized to support such loads in addition to the weight of the equipment, piping, or system, as applicable.
- d. Delegated Design: When anchor systems are used for supporting materials, equipment, or systems delegated to a design professional retained by CONTRACTOR, Subcontractor, or Supplier, provide anchor system suitable for loads indicated in delegated design documents and consistent with the design intent expressed in the Contract Documents.

C. Application:

- 1. Anchor Bolts:
 - a. Where anchor bolt is shown or indicated, use cast-in-place anchor bolt unless another anchor type is approved by ENGINEER.
 - b. Provide anchor bolts as shown or indicated, or as required to secure structural element to appropriate anchor surface.
- 2. Concrete Adhesive Anchors:
 - a. Use where adhesive anchors are shown or indicated for installation in concrete.
 - b. Suitable for use where subject to vibration.
 - c. Suitable for use in exterior locations or locations subject to freezing.
 - d. Suitable for use in submerged, intermittently submerged, or buried locations.
 - e. Do not use in overhead applications, unless otherwise shown or approved by ENGINEER.
 - f. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
- 3. Grout-filled Concrete Masonry Adhesive Anchors:
 - a. Use where adhesive anchors are shown or indicated for installation in grout-filled concrete masonry units.
 - b. Suitable for use where subject to vibration.
 - c. Suitable for use in exterior locations or locations subject to freezing.
 - d. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
- 4. Hollow Concrete Masonry Adhesive Anchors:

- a. Use where adhesive anchors are shown or indicated for installation in hollow concrete unit masonry.
 - b. Suitable for use where subject to vibration.
 - c. Suitable for use in exterior locations or locations subject to freezing.
 - d. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
5. Concrete Wedge Expansion Anchors:
- a. Use where expansion anchors are shown or indicated for installation in concrete.
 - b. Do not use where subject to vibration.
 - c. Do not use in exterior locations or locations subject to freezing.
 - d. Do not use in submerged, intermittently submerged, or buried locations.
 - e. Suitable for use in overhead applications.
6. Grout-filled Concrete Masonry Wedge Expansion Anchors:
- a. Use where expansion anchors are shown or indicated for installation on the interior face of grout-filled unit masonry.
 - b. Do not use where subject to vibration.
 - c. Do not use in exterior locations or locations subject to freezing.
7. Hollow Concrete Masonry Sleeve Expansion Anchors:
- a. Use where expansion anchors are shown or indicated for installation in hollow concrete unit masonry or solid brick.
 - b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
 - c. Do not use where subject to vibration.
 - d. Do not use in exterior locations or locations subject to freezing.
8. Drop-in Expansion Anchors:
- a. Use drop-in expansion anchors installed in concrete where light-duty anchors are required to support piping or conduit two-inch diameter or smaller.
 - b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
 - c. Do not use where subject to vibration.
 - d. Do not use at submerged, intermittently submerged, or buried locations.
 - e. Do not use in exterior locations or locations subject to freezing.
 - f. Suitable for use in overhead applications.
9. Concrete Undercut Anchors:
- a. Use where undercut anchors are shown or indicated for installation in concrete.
 - b. Suitable for use where subject to vibration.
 - c. Do not use in submerged, intermittently submerged, or buried locations.
 - d. Do not use in exterior locations or locations subject to freezing.
 - e. Suitable for use in overhead applications.

10. Concrete Inserts:
 - a. Use only where shown or indicated in the Contract Documents.
 - b. Allowed for use to support pipe hangers and pipe supports for pipe size and loading recommended by the concrete insert manufacturer.
11. Drive-In Expansion Anchors:
 - a. Use drive-in expansion anchors installed in concrete, precast concrete, grouted masonry units, or brick, where light-duty anchors are required to support piping or conduit one-inch diameter and smaller.
 - b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
 - c. Do not use in overhead applications.
12. For Use in Precast Concrete Planks:
 - a. To support piping or conduit six-inch diameter and smaller, use low-profile drop-in anchors, hollow concrete masonry adhesive anchors, or through-bolts.
 - b. For piping greater than six-inch diameter, or to support safety-related systems, use through-bolts. Each through-bolt shall consist of threaded rod, nuts, washers, and bearing plate.

2.2 MATERIALS

A. Anchor Bolts:

1. Interior Dry Non-corrosive Locations: Provide straight threaded carbon steel rods complying with ASTM F1554, Grade 36, with heavy hex nuts complying with ASTM A563 Grade 55, unless otherwise shown or indicated on the Drawings. Hooked anchor bolts are unacceptable.
2. Exterior, Buried, Submerged Locations, or When Exposed to Wastewater: Provide stainless steel straight threaded rods complying with ASTM F593, AISI Type 316, Condition A, with ASTM F594, AISI Type 316, stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required. Other AISI types may be used when approved by ENGINEER. Hooked bolts are unacceptable.
3. Equipment: Provide anchor bolts complying with material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor bolt projection. Anchor bolts shall be straight threaded rods with washers and nuts as specified in this Section. Hooked bolts are unacceptable.
4. Anchoring of Structural Elements: Provide anchor bolts of size, material, and strength shown or indicated in the Contract Documents.

B. Concrete Adhesive Anchors:

1. General:
 - a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.
2. Products and Manufacturers: Provide one of the following:

- a. HIT-RE 500-SD Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
 - b. SET-XP Epoxy-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
 - c. Halfen USA, Inc.
 - d. Or equal.
3. Adhesive:
- a. Adhesive system shall use two-component adhesive mix.
 - b. Epoxy adhesives shall comply with physical requirements of ASTM C881/C881M, Type IV, Grade 2 and 3, Class A, B, and C, except gel times.
 - c. Adhesives shall have a current evaluation report by ICC Evaluation Service for use in both cracked and uncracked concrete with seismic recognition for SDC A through F as tested and assessed in accordance with ICC-ES AC308.
 - d. Adhesives shall have minimum bond strength and minimum design bond strength (bond strength multiplied by strength reduction factor) in accordance with Table 05 05 33-A:

TABLE 05 05 33-A:
ADHESIVE BOND STRENGTH ^{1,2}

Anchor Rod Diameter / Dowel Size	Uncracked Concrete		Cracked Concrete	
	Bond Strength (psi)	Design Bond Strength (psi)	Bond Strength (psi)	Design Bond Strength (psi)
3/8-inch / #3	2040	1300	1090	700
1/2-inch / #4	1920	1200	920	560
5/8-inch / #5	1830	1150	710	390
3/4-inch / #6	1760	1050	710	460
7/8-inch / #7	1670	900	610	340
1-inch / #8	1650	1050	850	460
- / #9	1900	1000	800	400
1.25-inch / #10	1580	1000	730	400

Table Notes:

1. Bond strengths listed for hammer-drilled, dry hole.
2. Bond strengths listed for maximum short term concrete temperature of 110 degrees F and maximum long term concrete temperature of 75 degrees F.

4. Anchor:
- a. Provide continuously-threaded, AISI Type 316 stainless steel adhesive anchor rod. Threaded rods shall comply with the concrete adhesive anchor manufacturer's specifications as included in the ICC Service Evaluation Report for the anchor submitted. Nuts shall have specified proof load stresses equal to or greater than the minimum tensile strength of the stainless steel threaded rod used. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.

C. Grout-filled Concrete Masonry Adhesive Anchors:

1. General:
 - a. Adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
 2. Products and Manufacturers: Provide one of the following:
 - a. HIT-HY 150 Max Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
 - b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
 - c. Halfen USA, Inc.
 - d. Or equal.
 3. Adhesive:
 - a. Adhesive system shall use two-component adhesive mix.
 - b. Acrylate hybrid adhesives shall comply with the following:
 - 1) ASTM C579 compressive strength greater than 7,252 psi, or ASTM D695 compressive yield strength greater than or equal to 10,210 psi.
 - 2) ASTM C307 modulus of elasticity greater than 507,000 psi or ASTM D695 compressive modulus of elasticity greater than 660,800 psi.
 - c. Adhesives shall have current ICC Evaluation Service Report for use in grout-filled concrete masonry, tested and assessed in accordance with ICC-ES AC 58.
 4. Anchor:
 - a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM F594, AISI Type 316 stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.
- D. Hollow Concrete Masonry Adhesive Anchors:
1. General:
 - a. Adhesive anchors shall consist of threaded rods with a cylindrical mesh steel or plastic screen tube anchored into hollow concrete block masonry using an adhesive system.
 2. Products and Manufacturers: Provide one of the following:
 - a. HIT-HY 20 for Masonry Anchoring System, by Hilti Fastening Systems, Inc.
 - b. Acrylic-Tie Anchoring Adhesive, by Simpson Strong-Tie Company, Inc.
 - c. Halfen USA, Inc.
 - d. Or equal.
 3. Adhesive:
 - a. Adhesive system shall use two-component adhesive mix.
 - b. Hybrid adhesives shall comply with the following:
 - 1) ASTM D695 compressive strength, greater than 7,410 psi.
 - 2) ASTM D790 modulus of elasticity: 0.33×10^6 psi or ASTM D695 compressive modulus of elasticity greater than 0.668×10^6 psi.

- c. Adhesives shall have a current ICC Evaluation Service Report for use in hollow concrete masonry as tested and assessed in accordance with ICC-ES AC58.
 - 4. Anchor:
 - a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM F594, AISI Type 316, stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.
 - 5. Mesh Screen Tube:
 - a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.
 - b. Mesh shall be AISI 304 stainless steel.
- E. Concrete Wedge Expansion Anchors:
 - 1. General:
 - a. Concrete wedge expansion anchors shall consist of stud, wedge, nut, and washer.
 - 2. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4. Provide concrete wedge expansion anchors suitable for use in cracked and uncracked concrete in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete wedge anchors in accordance with ACI 355.2 prequalification tests.
 - 3. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
 - 4. Other Locations: Provide expansion anchors complete with nuts and washers, AISI Type 304 stainless steel anchor body, in accordance with ASTM A276 or ASTM A493.
 - 5. Concrete wedge expansion anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete with seismic recognition in seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.
- F. Grout-filled Masonry Wedge Expansion Anchors:
 - 1. General:
 - a. Grout-filled masonry wedge expansion anchors shall each consist of stud, wedge, nut, and washer.
 - 2. Product and Manufacturers: Provide one of the following:
 - a. Kwik-Bolt 3 Expansion Anchors, by Hilti Fastening Systems, Inc.
 - b. Wedge-All Wedge Anchors, by Simpson Strong-Tie Company, Inc.
 - c. Grout-In Anchros, Halfen USA, Inc.
 - d. Or equal.
 - 3. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4.
 - 4. Anchors shall be non-bottom bearing type with single-piece steel expansion clip providing 360-degree contact with base material and shall not require oversized holes for installation.

4. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
 5. Other Locations: Provide AISI Type 316 stainless steel anchor, complete with nut and washer, in accordance with ASTM A276 or ASTM A493.
 6. Grout-filled masonry wedge expansion anchors shall have a current ICC Evaluation Service report for use in fully-grouted concrete masonry construction when tested and assessed in accordance with ICC-ES AC01.
- G. Hollow Concrete Masonry Sleeve Expansion Anchors:
1. General:
 - a. Sleeve expansion anchors shall each consist of an externally threaded stud with full length expanding sleeve.
 2. Anchors shall comply with physical requirements of FS A-A-1922A. Anchors shall be non-bottom bearing type with single-piece steel expansion sleeve providing 360-degree contact with base material, and shall not require oversized holes for installation.
 3. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
 4. Other Locations: Provide expansion anchors complete with nuts and washers, Type 304 stainless steel, in accordance with ASTM A276 or ASTM A493.
- H. Drop-in Expansion Anchors:
1. General:
 - a. Drop-in expansion anchors shall each consist of an internally threaded, deformation-controlled expansion anchor with pre-assembled expander plug.
 2. Products and Manufacturers: Provide one of the following:
 - a. HDI Drop-In Anchors, by Hilti Fastening Systems, Inc.
 - b. Drop-In Anchor, by Simpson Strong-Tie Company, Inc.
 - c. Halfen USA, Inc.
 - d. Or equal.
 3. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633, complying with physical requirements of FS A-A-55614, Type I. Anchors shall be flush or shell type. Provide low-profile anchors for use in precast concrete planks.
- I. Concrete Undercut Anchors:
1. General:
 - a. Each concrete undercut anchor shall consist of threaded stud, thick-walled expansion sleeve, expander coupler, and nut and washer. Anchors shall be pre-set type or through-set type, as shown on the Drawings.
 2. Products and Manufacturers: Provide one of the following:
 - a. HDA Undercut Anchor, by Hilti Fastening Systems, Inc.

- b. DUC Ductile Undercut Anchor, by USP Structural Connectors.
 - c. Halfen USA, Inc.
 - d. Or equal.
- 3. Provide concrete undercut expansion anchors in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete undercut anchors in accordance with ACI 355.2 prequalification tests.
- 4. Installed anchor shall exhibit form fit between bearing elements and the undercut in the concrete.
- 5. Interior Dry Non-Corrosive Locations: Provide carbon steel anchors, complete with nuts and washers, zinc plated, in accordance with ASTM B633.
- 6. Other Locations: Provide stainless steel anchors, complete with nuts and washers, manufactured of AISI Type 316 stainless steel or materials complying with ISO 3506-1 and having corrosion resistance equivalent to AISI Type 316 stainless steel.
- 7. Concrete undercut anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete for seismic recognition for seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.

J. Concrete Inserts:

- 1. Manufacturers: Provide products of one of the following:
 - a. Unistrut Corporation.
 - b. Cooper B-Line, Inc.
 - c. Anvil International, Inc.
 - d. Or equal.
- 2. Spot Concrete Inserts:
 - a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall comply with ANSI/MSS SP-58, malleable iron, Type 18. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Provide nuts compatible with insert and to suit threaded hanger rod sizes.
- 3. Continuous Concrete Inserts:
 - a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall be continuous type and shall be manufactured from minimum 12-gage cold-formed channel sections, complying with ASTM A1011/A1011M, stainless steel, Grade 33, complete with styrofoam inserts, end caps, and means for attaching to forms. Provide channel nuts compatible with insert suitable for threaded hanger rod sizes.
- 4. Provide inserts with plain finish.

K. Drive-In Expansion Anchors:

- 1. General:
 - a. Drive-In expansion anchors shall each consist of stainless steel drive pin and expanding alloy body.

2. Provide Type 304 stainless steel drive pin with zinc alloy body. Anchor shall comply with physical requirements of FS A-A-1925A, Type 1.
- L. Unless approved by ENGINEER, do not use power-actuated fasteners or other types of bolts and fasteners not specified in this Section.
- M. Anti-Seizing Compound:
 1. Products and Manufacturers: Provide one of the following:
 - a. Pure Nickel Never-Seez, by Bostik.
 - b. Nickel-Graf, by Anti-Seize Technology.
 - c. Halfen USA, Inc.
 - d. Or equal.
 2. Provide pure nickel anti-seizing compound.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine conditions under which materials will be installed and advise ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Anchor Bolts:
 1. Provide anchor bolts as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
 2. Locate and accurately set anchor bolts using templates or other devices as required, prior to placing concrete. Wet setting of anchor bolts is unacceptable.
 3. Protect threads and shank from damage during installation and subsequent construction operations.
 4. Unless otherwise shown or approved by ENGINEER anchor bolts shall comply with Table 05 05 33-B:

**TABLE 05 05 33-B:
SINGLE ANCHOR ALLOWABLE LOADS ON ANCHOR BOLTS ¹**

Bolt Diameter (inch)	F1554 Grade 36				F1554			
	F593 Type 316, Condition A				Grade 55			
	Minimum Embedment (inch)	Minimum Edge Distance and Spacing ² (inch)	Shear ^{3,4} (lb)	Tension ³ (lb)	Minimum Embedment (inch)	Minimum Edge Distance and Spacing ² (inch)	Shear ³ (lb)	Tension ³ (lb)
1/2	6	9	947	1,815	8.5	12.75	1,245	2,393
5/8	7.5	11.25	1,508	2,895	10.5	15.75	1,980	3,810
3/4	9	13.5	2,231	4,290	13	19.5	2,933	5,640
7/8	10.5	15.75	3,080	5,918	15	22.5	4,050	7,793
1	12	18	4,040	7,770	17	25.5	5,318	10,088
1 1/8	13.5	20.25	5,090	9,789	19	28.5	8,930	12,435
1.1/4	15	22.5	6,463	12,429	21	31.5	8,505	15,030

Table Notes:

1. Table is based on ACI 318 and ACI 350, Appendix D, $f'_c = 4000$ psi. Table 05 05 33-B is not applicable to anchor bolts embedded in grouted masonry.
2. Critical edge distance and spacing are indicated in the table. Capacity of anchor bolts for other combination of edge distances and spacing shall be evaluated in accordance with ACI 318 and ACI 350, Appendix D.
3. Values for shear and tension listed are not considered to act concurrently. Interaction of tension and shear will be evaluated by ENGINEER in accordance with ACI 318 and ACI 350, Appendix D.

B. Adhesive Anchors, Undercut Anchors, and Expansion Anchors – General:

1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.

C. Adhesive Anchors:

1. Comply with manufacturer's written installation instructions and the following.
2. Drill holes to adhesive system manufacturer's recommended drill bit diameter to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits that comply with the tolerances of ANSI B212.15. Core-drilled holes are unacceptable.
3. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
4. Before injecting adhesive, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Prior to injecting adhesive into the drilled hole, dispense, to a location

appropriate for such waste, an initial amount of adhesive from the mixing nozzle, until adhesive is uniform color.

6. Inject adhesive into hole through injection system-mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
7. Twist anchors during insertion into partially-filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
8. Provide adequate curing in accordance to adhesive system manufacturer's requirements prior to continuing with adjoining Work that could place load on installed adhesive anchors. Do not begin adjoining Work until adhesive anchors are successfully tested or when allowed by ENGINEER.
9. Limitations:
 - a. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with anchor systems manufacturer's requirements during installation and curing of adhesive anchor system.
 - b. Oversized Holes: Advise ENGINEER immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by CONTRACTOR.
 - c. Embedment depths shall be based on installation in normal-weight concrete with compressive strength of 2,500 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.

D. Expansion Anchors:

1. Comply with expansion anchor manufacturer's written installation instructions and the following:
2. Drill holes using anchor system manufacturer's recommended drill bit diameter and to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits complying with tolerances of ANSI B212.15. Core drilled holes are unacceptable.
3. Before installing anchor, hole shall be made free of dust and debris by method recommended by anchor system manufacturer. Hole shall be brushed with anchor system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
4. Before installing anchor, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Protect threads from damage during anchor installation. Drive anchors not less than four threads below surface of the attachment. Set anchors to anchor manufacturer's recommended torque using a torque wrench.

E. Concrete Undercut Anchors:

1. Comply with undercut anchor manufacturer's written installation instructions and the following.
2. Protect threads from damage during anchor installation.
3. Drill hole to anchor manufacturer's specified depth and diameter using a drill bit matched to the specific anchor.
4. Before setting the undercut anchor, hole shall be free of dust and debris using method recommended by undercut anchor system manufacturer. Hole shall be blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
5. Insert the anchor by hand until anchor reaches bottom of hole.
6. Set anchor in accordance with manufacturer's instructions using anchor manufacturer's specified setting tool.
7. Verify that the setting mark is visible on the threaded rod above the sleeve.
8. Anchor shall be set to manufacturer's recommended torque, using a torque wrench.

F. Concrete Inserts:

1. Comply with concrete insert manufacturer's installation instructions.
2. Inserts shall be flush with slab bottom surface.
3. Protect embedded items from damage during concrete placing. Ensure that embedded items are securely fastened to prevent movement during concrete placing, and ensure that embedded items do fill with concrete during concrete placing.
4. Inserts intended for piping greater than four-inch diameter shall be provided with hooked rods attached to concrete reinforcing.

G. Anti-Seizing Compound:

1. Provide anti-seizing compound in accordance with anti-seizing compound manufacturer's installation instructions, at locations indicated in Paragraph 2.1.B of this Section.
2. Do not use anti-seizing compound at locations where anchor bolt or adhesive anchor will contact potable water or water that will be treated to become potable.

3.3 CLEANING

- A. After embedding concrete is placed, remove protection and clean bolts and inserts.

+ + END OF SECTION + +

SECTION 05 54 63

FLOOR ACCESS HATCH COVERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install floor access hatch covers.
2. The Work also includes:
 - a. Providing openings in and attachments to floor access hatch covers to accommodate the Work under this and other Sections, and providing for floor access hatch covers items such as anchorage devices, and all items required for which provision is not specifically included under other Sections.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items to be installed with or before floor access hatch covers Work.

C. Related Sections:

1. Section 09 91 00, Painting.
2. Section 33 05 13, Manholes and Structures

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
 - a. Manufacturer shall have not less than five years experience producing products substantially similar to those specified and, upon ENGINEER's request, shall submit documentation of not less than five satisfactory installations in place for not less than five years each.

B. Component Supply and Compatibility:

1. Obtain all products included in this Section regardless of the component manufacturer from a single floor access hatch covers manufacturer. Furnishing covers from more than one manufacturer is unacceptable.
2. Floor access hatch covers manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals for all components furnished under this Section.
3. Components shall be suitable for specified service conditions and shall be integrated into the overall assembly by the floor access hatch covers manufacturer.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. Detailed plans and other drawings showing location of products and direction of door swing; floor access hatch cover schedules indicating cover location, material, type, loading capacity, and other information; and fabrication details for the access hatch covers Work, including materials, thickness of metals, finishes, latching or locking provisions, type of anchorages, and accessory items.
 - 2. Product Data:
 - a. Copies of manufacturer's literature and specifications for each type of floor access hatch incorporated in the Work.
- B. Informational Submittals: Submit the following:
 - 1. Supplier Instructions:
 - a. Installation data, including setting drawings and templates.
 - 2. Qualifications Statements:
 - a. Manufacturer, when requested by ENGINEER.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping:
 - 1. Protect mill finish and other finish during shipping and installation by an attached, adhesive-backed vinyl material that is removable during and after installation of the access hatch cover.
- B. Storage and Protection:
 - 1. Protect steel members and packaged materials from corrosion and deterioration.

1.5 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.
- B. Special Warranty:
 - 1. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, or at option of OWNER, remove or replace structural components of the products specified in this Section found to have defect in material and workmanship during a period of five years after the date of Substantial Completion.

PART 2 – PRODUCTS

2.1 GENERAL

A. General:

1. Provide manufacturer's standard fabricated access hatch cover units, modified when necessary to comply with the Contract Documents. Where standard units are not available for the sizes and types required, provide custom-fabricated units of the same quality as manufacturer's similar standard-sized units.
2. Fabricate each access hatch cover unit in the shop, complete with anchors, gaskets, hardware, and accessory items, as required.

2.2 CHANNEL-FRAME TYPE ACCESS HATCH COVERS

A. Aluminum Floor Access Hatch Covers (H-20 Loading) – Channel Frame Type:

1. Design Live Load: H-20 truck loading in accordance with AASHTO Standard Specifications for Highway Bridges, intended for use in off-street locations that may occasionally be subject to H-20 wheel loads.
2. Products and Manufacturers: Provide one of the following:
 - a. Single-Leaf Door Aluminum Access Hatch Cover:
 - 1) Model THS, by U.S.F Fabrication.
 - 2) Type J-AL H-20, by The Bilco Company.
 - 3) Model FC-H20, by Acudor Products, Inc.
 - 4) Or equal.
3. Cover: Not less than 1/4-inch thick, aluminum diamond-pattern plate cover with stiffener plates, as required. Provide flush drop-handle for lifting the cover.
4. Frame: Extruded aluminum channel frame with manufacturer's standard anchor tabs or continuous anchor flange around the perimeter for anchorage to concrete.
5. Drain Coupling: 1.5-inch diameter NPT threaded drain coupling welded under the channel frame for connection of a drain pipe.
6. Gasket: EPDM gasket mechanically attached to the channel frame.
7. Hinges: Type 316 stainless steel, heavy-duty butt hinges with Type 316 stainless steel pin fastened to door with Type 316 stainless steel tamper resistant bolts.
8. Latch: Type 316 stainless steel, watertight, slam-type latch with inside lever handle and outside removable exterior turn/lift handle fastened to leaf (door) with tamper-resistant Type 316 stainless steel bolts. Latch release shall be protected by a flush, gasketed, removable screw plug.
9. Lift Assistance: Open-style stainless steel compression springs with Type 316 stainless steel guide tubes. Automatic Type 316 stainless steel hold-open arm with grip handle release.
10. Finish: Mill finish.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which floor access hatch cover Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install floor access hatch covers in accordance with approved Shop Drawings and other approved submittals, the Contract Documents, and manufacturer's instructions.
- B. Set floor access hatch covers level and true to line or grade, without warp or rack.
- C. Drain Piping for Channel Frames:
 - 1. Provide drain piping from the floor access hatch cover channel frame routed as shown or indicated on the Drawings.
 - 1. Provide drain piping from the floor access hatch cover channel frame and route to the nearest floor drain or sump pit in a manner that does not obstruct access for facility operations and maintenance.
 - 2. After installation, fill drain piping with water. Drain piping shall be free of visible leaks.
- D. Protection of Aluminum from Dissimilar Materials: Coat surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, steel, and other metals in accordance with Section 09 91 00, Painting.

3.3 ADJUSTING AND CLEANING

- A. Adjust leafs of floor access hatch covers as necessary to provide proper operations.
- B. Remove stains, concrete splatter, oils, grease, and other foreign materials necessary and provide clean, finished surfaces.

++ END OF SECTION ++

SECTION 26 05 00

ELECTRICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope: CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to complete the Electrical Work.
- B. Coordination:
 - 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the formwork, walls, partitions, ceilings and panels.
- C. Intent:
 - 1. Drawings show the principal elements of the electrical installation. They are not intended as detailed working drawings for the electrical Work but as a complement to the Specifications to clarify the principal features of the electrical systems.
 - 2. It is the intent of this Section that all equipment and devices, furnished and installed under this and other Sections, be properly connected and interconnected with other equipment so as to render the installations complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the Specifications or shown.
- D. Grounding: Ground all equipment in conformance with the National Electrical Code.
- E. Temporary Power:
 - 1. CONTRACTOR shall provide temporary light and power for construction purposes to be utilized by all trades on the project.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Permits: Obtain all permits required to commence work and, upon completion of the Work, obtain and deliver to ENGINEER a Certificate of Inspection and Approval from the State Board of Fire Underwriters or other authority having jurisdiction.
2. Codes: Material and equipment shall be installed in accordance with the current standards and recommendations of the National Electrical Code, the National Electrical Safety Code and with local codes which apply. Where discrepancies arise between codes, the most restrictive regulation shall apply.
3. Tests by Independent Regulatory Agencies: Electrical material and equipment shall be new and shall bear the label of the Underwriters' Laboratories, Inc., or other nationally-recognized, independent testing laboratory, wherever standards have been established and label service regularly applies.
4. Utilities:
 - 1) Power Company: Work in connection with the electric service shall be done in strict conformance with the requirements of the Power Company.

B. Reference Standards: Electrical material and equipment shall conform in all respects to the latest approved standards of the following:

1. National Electrical Manufacturers Association (NEMA).
2. The American National Standards Institute (ANSI).
3. The Institute of Electrical and Electronic Engineers (IEEE).
4. Insulated Cable Engineers Association (ICEA).
5. National Electrical Code (NEC).
6. National Electrical Safety Code (NESC).
7. National Fire Protection Association (NFPA).
8. Instrumentation Society of America (ISA).
9. Underwriters' Laboratories, Inc. (UL).

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:

1. Manufacturer's name and product designation or catalog number.
2. Electrical ratings.
3. Dimensioned plan, section, and elevations showing means for mounting, conduit connection, and grounding.
4. Materials and finish specification, including paints.
5. List of components including manufacturer's names and catalog numbers.
6. Internal wiring diagrams indicating all connections to components and numbered terminals for external connections.

1.4 JOB CONDITIONS

A. Existing Conditions:

1. CONTRACTOR shall examine the site and existing facilities in order to compare them with the Drawings and Specifications with respect to the conditions of the premises, location of and connection to existing facilities and any obstructions which may be encountered.
2. CONTRACTOR is cautioned to perform his work with due regard to safety and in a manner that will not interfere with the existing equipment or in any way cause interruption of any of the functions of the plant.

1.5 AREA CLASSIFICATIONS:

A. Materials and equipment shall conform to the area classification(s) shown, specified, and required.

1. Wet Locations: Comply with NEC and NEMA requirements for wet locations. Enclosures in wet locations shall comply with NEMA 4 unless specified otherwise.
2. Corrosive Locations: Comply with NEC and NEMA requirements for corrosive locations. Enclosures in corrosive locations shall conform to NEMA 4X requirements unless specified otherwise.
3. Hazardous Locations: Comply with NEC requirements for the Class and Division designated.

4. Dusty Locations: Indoor areas not designated as hazardous, corrosive, or wet are dusty locations. Comply with NEC and NEMA 12 requirements unless specified otherwise.

PART 2 - PRODUCTS

2.1 RACEWAY SYSTEMS

A. General:

Conduit types and the installation methods shall comply with the following, unless otherwise shown or indicated in the Contract Documents:

- a. Use galvanized rigid steel (GRS) conduit for exposed indoor conduit runs in non-corrosive areas.
- b. Use PVC-coated rigid steel conduit for exposed interior or exterior conduit runs in hazardous, wet, and corrosive locations.
- c. Use PVC-coated rigid steel conduit for individual conduits direct-buried in the ground.
- d. Use Schedule 40 PVC or steel conduit for concrete-encased duct bank runs.
- e. Use steel or Schedule 40 PVC conduit for conduit runs embedded in structural concrete slabs.

1. Coordination:

- a. Conduit runs shown are diagrammatic.
- b. Coordinate conduit installation with piping, ductwork, lighting fixtures and other systems and equipment and locate so as to avoid interferences.

B. Rigid Steel Conduit, Elbows, and Couplings:

1. Material: Rigid, heavy wall, mild steel, hot dip galvanized, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.
2. Manufacturers: Provide products of one of the following:
 - a. Allied Tube and Conduit.
 - b. Wheatland Tube Company.
 - c. Western Tube and Conduit Corporation.
 - d. Or equal.

C. PVC Coated Rigid Steel Conduit, Elbows, and Couplings:

1. Material: Rigid, heavy wall, mild steel, hot dip galvanized, smooth urethane interior coating, tapered threads, carefully reamed ends, 3/4-inch NPS minimum size with a factory exterior coating of 40-mil thick polyvinyl chloride.
2. Color: Color of coating shall be the same on all conduit and fittings.
3. Manufacturers: Provide products of one of the following:
 - a. Robroy Industries.
 - b. Perma-Cote Industries.
 - c. OCAL, Inc.
 - d. Or equal.

D. Metallic Conduit Fittings, and Outlet Bodies:

1. Material and Construction: Cast gray iron alloy, cast malleable iron or aluminum bodies and covers consistent with conduit material. Units to be threaded type with five full threads. Conform to ANSI C80.4 and be listed by UL. Do not use "LB" fittings. Use type "LBD" fittings where use of fittings is unavoidable.
2. Use: Conduits shall be gasketed and watertight in hazardous, wet, and corrosive locations.

E. PVC Conduit:

1. Material: Schedule 40 PVC plastic, NEMA Type EPC-40-PVC, 90 C rated, conforming to UL No. 651.
2. Fittings: Form elbows, bodies, terminations, expansions and fasteners of same material and manufacturer as base conduit. Provide cement by same manufacturer as base conduit.

F. Conduit Hubs:

1. Material: Threaded conduit hub, vibration proof, weather proof, with captive O-ring seal, zinc metal with insulated throat and bonding screw.
2. Use: Provide for all conduit terminations to boxes, cabinets, and other enclosures in areas designated as wet locations.

G. Conduit Bushings and Locknuts:

1. Insulated Busings: Malleable iron body with plastic liner. Threaded type with steel clamping screw. Provide with bronze grounding lug, as required.
2. Locknuts: Steel for sizes 3/4-inch through 2-inch diameter and malleable iron for sizes 2.5-inch through 4-inch diameter.
3. Use: Provide for all conduit terminations to boxes, cabinets and other enclosures except threaded type in areas designated as dusty locations.

H. Thruwall Seals

1. For conduits passing through new exterior block walls or through core-drilled holes in existing exterior subsurface walls, exterior concrete walls, floor slabs, and roof slabs, and for conduits passing through existing interior concrete walls or floors and interior block walls.

I. Duct Sealing Compound

1. Soft, fibrous, slightly tacky, non-hardening sealing compound.
2. Remains workable at all temperatures.

J. Flexible Conduit:

1. Material: Flexible galvanized steel core with smooth, abrasion resistant, liquid-tight, polyvinyl chloride cover. Continuous copper ground built in for sizes 3/4-inch through 1.25-inch. Material shall be UL listed.

K. Flexible Conduit Fittings:

1. Material and Construction: Malleable iron with cadmium finish. Fittings shall adapt the conduit to standard threaded connections, shall have an inside diameter not less than that of the corresponding standard conduit size and shall be UL listed.
2. Use: Provide on flexible conduit in non-hazardous and Class 1, Division 2 hazardous areas.

L. PVC-Coated Conduit Fittings:

1. Material and Construction: Malleable iron with standard finish and 40-mil PVC exterior coating. Fittings shall adapt the conduit to standard threaded connections, shall have an inside diameter not less than that of the corresponding standard conduit size.
2. Use: Provide on flexible conduit in areas designated as corrosive locations.

3. Manufacturers: Provide products of one of the following:
 - a. Robroy Industries.
 - b. Permacote Industries.
 - c. OCAL, Inc.
 - d. Or equal.

M. Pull, Junction, and Terminal Boxes:

1. Material and Construction (Wet, Corrosive and Hazardous Locations):
 - a. Cast gray iron alloy with hot-dip galvanized finish or cast malleable iron bodies and covers.
 - b. Neoprene gaskets for wet and corrosive locations. Gaskets shall be an approved type designed for the purpose. Improvised gaskets are not acceptable.
 - c. Stainless steel cover bolts.
 - d. External mounting lugs.
 - e. Drilled and tapped conduit holes.
 - f. Boxes where conduits enter a building below grade shall have 1/4-inch drain hole at the bottom of the box.
 - g. Threaded connections for explosion proof boxes.
2. Boxes for installation in areas classified as hazardous locations shall be explosion proof and shall comply with UL886.
3. Manufacturers: Provide products of one of the following:
 - a. Appleton Electric Company.
 - b. Crouse-Hinds Company.
 - c. Hoffman Engineering Company.
 - d. Or equal.
4. Terminal Blocks: Material and Construction:
 - a. NEMA rated nylon modular terminal blocks.
 - b. 600-volt rated.
 - c. Control and alarm circuit terminals shall be screwed type with permanently affixed numeric identifiers beside each connection.

- d. Power terminals shall be copper and rated for the circuit ampacity.

2.2 WIRE AND CABLE

A. Insulated Cable In Raceways:

1. Application: Use for circuits located indoors and outdoors.
2. Manufacturers: Provide products of one of the following:
 - a. Southwire.
 - b. The Okonite Company.
 - c. American Insulated Wire
 - d. General Cable
 - e. Or equal.
3. Material: Single conductor copper cable complying with ASTM B3 and ASTM B8 with flame-retardant, moisture- and heat-resistant insulation rated for 90 degrees C in dry or wet locations, listed by UL as Type XHHW-2 or RHW-2 complying with UL 44.
4. Wire Sizes: Not smaller than No. 12 AWG for power and lighting and No. 14 AWG for 120-volt control circuits.
5. Stranding: 600-volt cable shall be stranded, except that solid cable, No. 10 and smaller may be used for lighting circuits.

B. Instrumentation Cable:

1. Single Shielded Pair Instrument Cable:
 - a. Tinned copper, XLPE insulated stranded conductors, No. 16 AWG minimum, twisted pair with overall shield, stranded tinned No. 18 AWG copper drain wire and overall chrome PVC jacket. Rated for 600 volts minimum and conforming to UL 1581.
 - b. Manufacturers: Provide products of one of the following:
 - 1) Belden Company.
 - 2) Okonite Company.
 - 3) Dekoron Wire and Cable Company.
 - 4) Or equal.

2.3 WIRING DEVICES

A. Device Boxes:

1. Material: In Wet Locations: Cast gray iron alloy or cast malleable iron with zinc electroplate finish, or aluminum bodies consistent with conduit material.
 - a. In Dusty Locations: Zinc-coated sheet steel or aluminum bodies consistent with conduit material.
 - b. Where conduit is installed concealed, boxes shall include suitable extension rings and covers, as required.
 - c. Where used with PVC-coated conduit system, boxes shall include factory-applied 40-mil-thick PVC coating.
 - d. Cast boxes shall be hub-type and include external mounting lugs.
 - e. Metallic outlet boxes shall comply with UL 514A.
 - f. Fittings for outlet boxes shall comply with UL 514B.
2. Cover Plates:
 - a. Type 302 stainless steel alloy for indoor finished areas.
 - b. Plates in corrosive locations shall include a factory applied 40-mil PVC coating.
 - c. Stainless steel screws and hardware.
 - d. For receptacle and switch cover plates, see below.

B. Disconnect Switches:

1. Single Throw, Circuit Disconnect Switches:
 - a. Type: Fused or unfused, horsepower rated, heavy-duty, single throw, quick- make, quick-break mechanism, visible blades in the "OFF" position and safety handle.
 - b. Rating: Voltage and current ratings and number of poles as required for motor or equipment circuits being disconnected. Switches shall bear a UL label and shall comply with the requirements of UL 98, NEMA KS-1 and NEMA 250.
2. Enclosures: As required for the area classifications specified in paragraph 1.5 above.

2.4 SUPPORTING SYSTEMS

A. Strut, Fittings, and Accessories:

1. Strut materials shall correspond to area classifications in paragraph 1.5 above and noted on the Drawings.
 - a. Dusty Locations:
 - 1) Strut shall be 12-gauge carbon steel, conforming to ASTM A1011, painted with an electroplated epoxy base paint unless noted otherwise.
 - b. Wet or Corrosive Locations:
 - 1) Strut shall be 12-gauge Type 316 stainless steel unless noted otherwise.
2. Where indicated or when installed with PVC-coated conduit, boxes or devices, strut shall be 12-gauge Type 316 stainless steel.
3. Unless otherwise shown or specified, strut shall be 1-5/8 inches by 1-5/8 inches. Double struts shall be two pieces of the same strut, welded back-to-back at the factory.
4. Attachment holes, when required, shall be factory punched on hole centers approximately equal to the cross sectional width and shall be 9/16-inch diameter.
5. Fittings, braces, brackets, hardware, and accessories shall be stainless steel.
6. Strut nuts shall be spring captured stainless steel.
7. Square and round washers shall be stainless steel.

B. Hanger Rods:

1. Shall be all-thread, zinc coated in dry locations and stainless steel in wet, corrosive, and hazardous areas.
2. Shall be minimum 3/8-inch diameter unless otherwise shown on the Drawings or specified.

C. Beam Clamps for Attaching Threaded Rods or Bolts to Beam Flanges for Hanging Struts or Conduit Hangers:

1. Beam clamps shall be stainless steel equipped with a stainless steel square-head set screw and shall include a threaded hole sized for attaching the all-thread rod or threaded bolt.

D. Miscellaneous Hardware:

1. Bolts, screws, and washers shall be stainless steel.
2. Hex Nuts: Shall be stainless steel and include nylon inserts.

2.5 ELECTRICAL IDENTIFICATION

A. Engraved Identification Devices (Nameplates and Legend Plates):

1. Nameplates:

- a. Laminated phenolic plastic, 1/16-inch thick, engraved condensed block black lettering on white background, square corners, and beveled front edges, or match existing.
- b. Size: As required.
- c. Letter Size: Minimum 3/16-inch.
- d. Nameplates one inch or less in height shall have one mounting hole at each end. Nameplates greater than one inch in height shall have mounting holes in the four corners.

2. Legend Plates:

- a. Legend plates for pushbuttons, pilot lights, selector switches and other panel mounted devices shall be large size with dimensions of approximately 2-7/16 inches wide by 2-13/32 inches tall (Allen Bradley large automotive size), plastic, custom engraved with black letters on white background.
 - 1) Standard size legend plates shall be provided where devices are mounted on motor control centers and spacing of the devices precludes the use of automotive size legend plates.
- b. Lettering size and line weight shall be the same for all legend plates on the same panel or enclosure. Maximum size shall be 1/4-inch and minimum size shall be 1/8-inch.

B. Voltage System Identification Directories:

1. General:

- a. Directories shall be laminated thermoset plastic, 1/16-inch thick, engraved block black letters on white background, square corners, and beveled front edges.

- b. Directories shall identify all voltage systems within the building.
- c. Directories shall list the colors that identify ungrounded and grounded conductors of each system.
- d. Colors shall be per Part 3.1, Installation, Paragraph D, Wire and Cable
- e. Example Directory Text:

Voltage System Identification		
System	A, B, C	Neutral
277/480	Brown, Orange, Yellow	Gray
120/208	Black, Blue, Red	White

- 2. Large directories for rooms shall have a minimum text height of 1/2-inch.
- 3. Small directories for equipment shall have a minimum text height of 1/4-inch.

C. Conduit Labels:

- 1. Shall be pre-tensioned acrylic/vinyl construction coiled to completely encircle conduit for conduit up through 5-inch diameter, or pre-molded to conform to the circumference of conduit 6-inch and larger.
- 2. Strap-on style for 6-inch conduit shall be attached with stainless steel springs.
- 3. Shall be blank for use with custom printed labels.
- 4. Custom Labels:
 - a. Shall have black lettering on yellow background.
 - b. Shall not contain abbreviations in legend.
 - c. Shall be custom printed on continuous tape with permanent adhesive using thermal printer specified below.

D. Wire Identification:

- 1. Heat Shrinkable Wire and Cable Labeling System:
 - a. White heat-shrinkable irradiated polyolefin shrink-on sleeves. Labels shall be thermal printed. Labels shall be at least 2 inches wide.
- 2. Wrap-Around Wire and Cable Labeling System:

- a. Self laminating white/transparent self extinguishing vinyl strips. Length shall be sufficient to provide at least 2.5 wraps. Labels shall be thermally printed. Labels shall be at least 2 inches wide.

E. Thermal Printing System:

- 1. Utilize a thermal transfer process to create non-smearing labels and markers.

F. Fabrication

- 1. Engraved Identification Devices (Nameplates and Legend Plates):
 - a. Nameplate and legend plate text is preliminary and subject to change pending final review and acceptance of the nomenclature by the ENGINEER after start-up and testing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

- 1. Mount equipment so that sufficient access and working space is provided for safe operation and maintenance.
- 2. Securely fasten enclosures to walls and other structural surfaces on which they are mounted. Provide independent supports where no walls or other structural surface exists.
- 3. Install in conformance with the National Electrical Code.

B. Raceway Systems:

- 1. Install in conformance with governing codes and regulations.
- 2. Supports:
 - a. Rigidly support conduits by clamps, hangers, or unistrut channels. Conduit supports and accessories shall be per Part 2.8, Supporting Systems
 - b. Support single conduits by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the

support surface. Support multiple runs of conduits on trapeze type hangers.

3. Fastenings: Fastener material to the extent possible shall be consistent with conduit material. For PVC coated rigid steel conduit runs, fasteners shall have a factory applied PVC coating or shall be stainless steel. Fasten raceway systems rigidly and neatly to supporting structures by the following methods:
 - a. To Wood: Wood screws.
 - b. To Hollow Masonry Units: Toggle bolts.
 - c. To Brick Masonry: Expansion bolts by Price, or equal.
 - d. To Concrete: Anchors by Phillips; Hilti Corp.; or equal.
 - e. To Steel: Beam clamps per Part 2.8, Supporting Systems.
4. Exposed Conduit:
 - a. Install parallel or perpendicular to structural members or walls.
 - b. Where possible, run in groups. Provide conduit racks of suitable width, length, and height, arranged to suit field conditions. Provide support every ten feet, minimum.
 - c. Install on structural members in protected locations.
 - d. Locate clear of interferences.
 - e. Provide 6 inches of clearance from hot fluid lines and 1/4-inch from walls.
 - f. Install vertical runs plumb. Unsecured drop length shall not exceed 12 feet.
5. Empty Conduits:
 - a. Install nylon pull wire in each empty conduit and cap conduits not terminating in boxes with permanent fittings designed for the purpose.
6. Field Bends: No indentations. Diameter of conduit shall not vary more than 15 percent at bends.
7. Joints:
 - a. Apply conductive compound to joints before assembly.
 - b. Make up joints tight and ground thoroughly.
 - c. Use standard tapered pipe threads for conduit and fittings.
 - d. Cut conduit ends square and ream to prevent damage to wire and cable.

- e. Use full threaded couplings. Split couplings are not allowed.
 - f. Use strap wrenches and vises to install conduit. Replace conduit with wrench marks.
 - g. Apply zinc-rich paint to exposed threads and other areas of galvanized conduit system where the base metal is exposed.
8. Terminations:
- a. Install insulated bushings on conduits entering boxes or cabinets, except when threaded hubs are used.
 - b. Provide locknuts on both inside and outside of enclosure, except when threaded hubs are used.
 - c. Use bushings in lieu of locknuts is not allowed.
 - d. Install conduit hubs on conduits entering boxes or cabinets in wet and corrosive areas.
9. Moisture Protection:
- a. Plug or cap conduit ends at time of installation to prevent entrance of moisture and foreign materials.
 - b. Underground and embedded conduit connections shall be watertight.
 - c. Thruwall Seals and Conduit Sealing Bushings: Install for conduits passing through concrete slabs, floors, walls, or concrete block walls.
 - d. Drainage: Pay particular attention to drainage for conduit runs. Where possible install conduit runs to drain to one end and away from building. Avoid pockets or depressions in conduit runs.
 - e. Seal conduit openings within control and instrumentation panels and distribution equipment with duct sealing compound to provide watertight seal.
10. Corrosion Protection:
- a. Conduit Curb:
 - 1) For conduits routed in concrete slabs or floors and stub-ups through the floor, provide 3 inch high concrete curb, extending 2-inches from the outer surface of the conduit penetrating the floor, to prevent corrosion. For floor-mounted equipment, the concrete equipment base shall be in lieu of the concrete curb.
 - 2) Conduit stub-ups shall be a 90 degree PVC coated rigid galvanized steel conduit elbow. PVC coated elbow shall extend a minimum of 1/2-inch above the top of the concrete curb or equipment base. Should the elbow

not reach this height, provide PVC-coated conduit extension to accommodate specified requirements. Provide coupling/fitting for transition from rigid galvanized steel conduit or PVC conduit in slab to PVC-coated elbow.

- 3) For conduits stubbing up and terminating at equipment enclosure mounted on a concrete base, provide insulated grounding bushing on the PVC-coated rigid steel elbow.
- 4) For conduits stubbing up and extending to boxes, cabinets, and other enclosures above the concrete curb in wet and dusty areas, provide conduit coupling/fittings between the PVC-coated rigid steel elbow and rigid steel conduit for transition between the two conduit types.
- 5) For conduits stubbing up and extending to boxes, cabinets, and other enclosures above the concrete curb or equipment base in corrosive areas, continue the conduit system with PVC-coated rigid steel conduit

b. Dissimilar Metals:

- 1) Prevent the occurrence of electrolytic action between dissimilar metals.
- 2) Do not use copper products in connection with aluminum, and do not use aluminum in locations subject to drainage of copper compounds on the bare aluminum.
- 3) Back paint aluminum in contact with masonry or concrete with two coats of aluminum-pigmented bituminous paint.

11. Core drill for individual conduits passing through existing concrete slabs and walls. Notify ENGINEER in writing in advance of core drilling. Prior to core drilling, drill sufficient number of small exploratory holes to establish that the area to be core drilled is free of existing embedded conduits. Seal spaces around conduit as indicated above in Paragraph 3.1.B.11.c.

12. PVC-Coated Rigid Steel Conduit:

- a. Install in accordance with manufacturer's recommendations.
- b. Install with manufacturer's installation tools to avoid damage to PVC coating.
- c. Repair damaged PVC coating with manufacturer's recommended touch-up compound.

13. Flexible Conduit:

- a. Install at motors, transformers, field instruments, and equipment that are subject to vibration or require movement for maintenance purposes. Provide necessary reducer where equipment furnished cannot accept

3/4-inch diameter flexible conduit. Limit flexible conduit length to three feet maximum.

- b. Install in conformance with the governing codes.

14. Pull and Junction Boxes:

- a. Mount boxes so that sufficient access and working space is provided and maintain a minimum clearance of 1/4-inch from walls.
- b. Securely fasten boxes to walls or other structural surfaces on which they are mounted. Provide independent supports that comply with Paragraph 2.8, Supporting Systems, where boxes will not be mounted on walls or other structural surface.
- c. Install pull boxes where shown, and provide pull boxes in conduit runs containing more than three 90-degree bends, and in conduit runs exceeding 200 feet.
- d. Provide removable, flame-retardant, insulating cable supports in boxes with any dimension exceeding three feet.
- e. Field apply PVC touch up to scratched PVC boxes damaged during installation. Touch up work shall be in conformance with manufacturer's recommendations and instructions.
- f. Size junction, pull, and terminal boxes in accordance with the requirements of the NEC Article 314 and other governing codes.
- g. Install terminal blocks in boxes where shown or where cable terminations or splices are required.

15. Sealing Fittings: Install for hazardous and corrosive locations as required by the National Electrical Code and where shown on the Drawings.

16. Expansion/Deflection Fittings: Install fittings where conduits cross structural expansion joints.

- a. Underground Ductbank:

C. Wire and Cables:

1. Power Cable:

- a. Install cables complete with proper terminations at both ends. Check and correct for proper phase sequence and proper motor rotation.
- b. Pulling:
 - 1) Use insulating types of pulling compounds containing no mineral oil.

- 2) Pulling tension shall be within the limits recommended by the wire and cable manufacturer.
- 3) Use a dynamometer where mechanical means are used.
- 4) Cut off section subject to mechanical means.
- c. Bending Radius: Limit to a minimum of six times cable overall diameter.
- d. Slack: Provide maximum slack at all terminal points.
- e. Splices:
 - 1) Where possible, install cable continuous, without splice, from termination to termination.
 - 2) Where required, splice as shown and also where required for cable installation. Splices below grade, in manholes, handholes, and wet locations shall be waterproof.
 - 3) Splices are not allowed in conduits.
- f. Identification:
 - 1) Identify conductors in accordance with Paragraph 2.9, Electrical Identification,
 - 2) Identify power conductors by circuit number and phase at each terminal or splice location.
 - 3) Identify control and status wiring using numeral tagging system.
- g. Color code power cables as follows:
 - 1) No. 8 AWG and Smaller: Provide colored conductors.
 - 2) No. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, wrapped in overlapping turns to cover an area of at least 2 inches.
 - 3) Colors: Match color scheme in use at the Site. If the Site does not have an existing color scheme, use the following colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120 Volts Single-Phase, Three-Wire	Grounded Neutral	White
	One Hot Leg	Black
	Other Hot Leg	Red
208Y/120 Volts Three-Phase, Four-Wire	Grounded Neutral	White
	Phase A	Black
	Phase B	Red
	Phase C	Blue
240/120 Volts Three-Phase, Four-Wire Delta, Center Tap Ground on Single-Phase	Grounded Neutral	White
	Phase A	Black
	High (wild) Leg	Orange
	Phase C	Blue
480Y/277 Volts Three-Phase, Four-Wire	rounded Neutral	Gray
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow

2. Instrumentation Cable:

- a. Install cable complete with proper terminations at both ends.
- b. Install in conduit separate from power cables, unless specified otherwise.
- c. Ground shield on shielded cables at one end only and as recommended by instrument manufacturer.
- d. Identify conductors in accordance with Part 2.9, Electrical Identification.
- e. Install and terminate vendor furnished cable in accordance with vendor equipment requirements and cable manufacturer's recommendations.
- f. Install in conformance with the National Electrical Code.

D. Grounding Systems:

1. Equipment Grounding:

- a. Ground electrical equipment in compliance with the governing codes and the Contract Documents.
- b. Equipment grounding conductors shall be bare stranded copper cable of adequate size installed in metal conduit where required for mechanical protection. Ground conductors, pulled into conduits with non-grounded conductors, shall be insulated. Insulation shall be green.
- c. Control panels grounding conductors shall be bare stranded copper cable of adequate size to the ground grid from the AC ground bus, and an insulated stranded copper cable of adequate size to the ground grid from the DC ground bus.
- d. Connect ground conductors to conduit with copper clamps, straps, or with grounding bushings.
- e. Connect to piping by welding or brazing. Use copper bonding jumpers on gasketed joints.
- f. Connect to equipment by means of lug compressed on cable end. Bolt lug to equipment frame using holes or terminals provided on equipment specifically for grounding. Do not use hold-down bolts. Where grounding provisions are not included, drill suitable holes in locations recommended by the equipment manufacturer or designated by ENGINEER.
- g. Connect to motors by bolting directly to motor frames, not to soleplates or supporting structures.
- h. Connect to service water piping by means of copper clamps. Use copper bonding jumpers on gasketed joints.
- i. Scrape bolted surfaces clean and coat with a conductive oxide-resistant compound.

E. Supporting Systems:

- 1. Install supporting systems with all necessary channels, fittings, brackets, and related hardware for mounting and supporting equipment. Include anchor bolts, concrete inserts and associated hardware for proper support of equipment.
- 2. Equipment and devices shall be installed on supporting systems as shown on the Drawings, specified, or required.
- 3. Install supporting devices level, parallel, and perpendicular to building walls and floors, such that the support system is installed in a neat and professional manner.

4. Holes in suspended ceilings for support rods and other equipment shall be made adjacent to bars where possible to facilitate removal of ceiling panels.
5. Installation of supporting systems shall be coordinated with equipment, cabinets, consoles, panels, enclosures, boxes, conduit, cable tray, wireway, busway, cablebus, piping, ductwork, lighting fixtures, and other systems and equipment, and located clear of interferences and access ways.
6. Anchor Bolts, Expansion Anchors, and Concrete Inserts: Shall be per Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts, and the additional requirements of this Section.

F. Mounting of Conduit:

- a. A minimum of 1/4-inch space shall be provided between conduit surfaces and abutting or near surfaces except struts, cable trays, steel beams, and columns.
 - b. Conduit shall be fastened to struts, cable trays, steel beams, and columns using specified clamps and straps as shown, specified, and required.
 - c. Devices shall be compatible with size of conduit and type of support. Size identification shall be visible and legible after installation.
2. Install conduit supports and fasteners per Paragraph 2.1, Raceway Systems.
 3. Drilling into beams or columns is not allowed except as authorized by ENGINEER.
 4. All nuts and bolts shall be tightened to the following values per B-line manufacturer recommendations:

Bolt Size	Torque (ft-lbs)
1/4" – 20	6
5/16" – 18	11
3/8" – 16	19
1/2" – 13	50

G. Field Cutting:

- a. Cut edges of strut and hanger rod shall have corners rounded, edges beveled and burrs removed. If field cutting the strut is required, use only

clean, sharp, dedicated tools. Oil, shavings, and other residue of cuttings shall be removed prior to installation.

b. Coatings:

- 1) Cut edges shall be coated with an epoxy base touchup paint to prevent corrosion.
- 2) Cut edges shall be coated with a zinc rich paint to prevent corrosion.

H. Electrical Identification:

1. Install electrical identification per manufacturer recommendations and as required for proper equipment identification.
2. Engraved Identification Devices (Nameplates and Legend Plates):
 - a. Unless otherwise specified, permanent nameplates shall be attached with a permanent adhesive and with 3/16-inch diameter, round head, stainless steel machine screws into drilled and tapped holes.
 - b. A nameplate with 1.5-inch letters shall be provided to identify each console, cabinet, panel, or enclosure as shown or specified.
 - c. Nameplates shall be provided for field mounted motor starters, disconnect switches, manual starter switches, pushbutton stations, and similar equipment operating components and shall describe the motor or equipment function and the circuit number.
 - d. Nameplates with 1/2-inch letters shall be provided to identify each junction and terminal box shown or specified.
 - e. On switchgear, nameplates shall be furnished for all main and feeder circuits including control fuses and also for all indicating lights and instruments.
 - 1) A nameplate with 1.5-inch letters shall be provided giving switchgear designation, voltage rating, ampere rating, short circuit rating, manufacturer's name, general order number, and item number.
 - 2) The individual door for each compartment shall be identified with a nameplate giving item designation and circuit number.
 - f. Except conduit, all other electrical appurtenances including lighting panels, convenience outlets, fixtures, and lighting switches shall be provided with nameplates indicating the appropriate circuit breaker number(s).

3. Conduit Labels:

- a. Conduits shall be provided with conduit labels unless otherwise specified.
 - b. Flexible conduit shall not be labeled.
 - c. Exposed single conduit runs of less than 25 feet between local disconnect switches and their associated equipment will not be labeled.
 - d. Conduit labels shall convey the following information:
 - 1) Contract Number: Alphanumeric, three or four digits, as applicable.
 - 2) Conduit Number: Alphanumeric as shown on the Drawings, as assigned by CONTRACTOR for unlabelled conduits, and per approved submittals.
 - e. Conduit labels shall be installed at the following locations:
 - 1) Where conduit enters or exits walls, ceilings, floors, or slabs.
 - 2) Where conduit enters or exits boxes, cabinets, consoles, panels, or enclosures, except pull boxes and conduit bodies used for pull boxes.
 - 3) At maximum intervals of 50 feet along the length of the conduit.
 - f. Conduit labels shall be oriented to be readable.
4. Wire and Cable Identification:
- a. Color-coding of insulated conductors shall comply with Paragraph 2.3, Wire and Cable
 - b. Use heat shrinkable wire labels where wire or cable is terminated. Use wrap-around labels where wire or cable is to be labeled but is not terminated.
 - c. Provide wire and cable labels as follows:
 - 1) New, rerouted, or revised wire or cable shall be labeled.
 - 2) Insulated conductors shall be labeled.
 - 3) Bare (uninsulated) conductors shall not be labeled unless otherwise shown or specified.
 - 4) Wire and cable terminations shall be labeled.
 - a) Wire labels shall be applied between 1/2-inch and one inch of the completed termination
 - b) Cable labels shall be applied between 1/2-inch and one inch of cable breakout into individual conductors.

- (1) Individual conductors in a cable shall be labeled after the breakout as specified for wires.
 - 5) Wire or cable exiting cabinets, consoles, panels, terminal boxes, and enclosures shall be labeled.
 - a) Wires or cables shall be labeled within two inches of the entrance to the conduit.
 - 6) Wire or cable in junction boxes and pull boxes shall be labeled
 - a) Wires or cables shall be labeled within two inches of the entrance to the conduit.
 - 7) Wire and cable installed in cable tray shall be labeled.
 - a) Wire and cable shall have labels at maximum intervals of 20 feet.
 - 8) Wire and cable installed without termination in electrical manholes shall be labeled.
 - a) Wire and cable shall have wrap-around labels applied within one foot of exiting the manhole.
 - d. Wire and Cable Identification System:
 - 1) Wire and cable labels shall be imprinted with an identifying designator.
 - a) Wire and cable extending between two devices or items and that does not undergo a change of function shall be identified by a single unique designator.
5. Terminal Strip Labeling:
- a. The panel side of the terminal shall be labeled to match the panel wire number.
 - b. The field side of the terminal shall be labeled to match the field wire number. The terminal number shall not include the contract number.

3.2 INSPECTIONS, TESTING AND ADJUSTMENTS

- A. Inspections: Accompany the normal installation tests with inspections to demonstrate to the satisfaction of the OWNER the following:
 - 1. Connections: All circuits are properly connected in accordance with the Drawings and applicable approved Shop Drawings.
 - 2. Operation: All circuits and devices are operable.
 - 3. Identification: All conductors are properly identified at each terminal.

B. Testing:

1. Rigid Conduit:

- a. Test conduits by pulling through each conduit a cylindrical mandrel with length not less than two pipe inside diameters, having an outside diameter equal to 90 percent of the conduit's inside diameter.
- b. Maintain a record, by number, of all conduits that are successfully tested.
- c. Repair or replace conduits that do not successfully pass testing and re-test.

2. 600 Volt Cable:

- a. Test each electrical circuit after permanent cables are in place, to demonstrate that the circuit and equipment are connected properly and will perform satisfactorily, and that they are free from improper grounds and short circuits.
- b. Individually test 600 volt cable mechanical connections after installation and before they are put in service with a calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.
- c. Individually test 600 volt cables for insulation resistance between phases and from each phase to ground. Test after cables are installed and before they are put in service with a Megger for one minute at a voltage rating recommended by the cable manufacturer or in accordance with NETA recommendations.
- d. The insulation resistance for each conductor shall not be less than the value recommended by the cable manufacturer or in accordance with ICEA standards. Any cable not meeting the recommended value or that fails when tested under full load conditions shall be replaced with a new cable for its full length.
- e. Where existing cables are spliced to cables provided under this Contract, the existing cables shall be tested prior to splicing. Test cables at 1,000 volts DC for one minute. The entire spliced cable installation shall be re-tested after the splice is completed. Existing cable that fails or has a value less than two megohms shall be brought to the ENGINEER's attention and the splicing shall not proceed.

3. Instrumentation Cable:

- a. Test wiring per Paragraph 2.3, Wire and Cable.

- b. Test shielded instrumentation cable shields with an ohmmeter for continuity along the full length of the cable and for shield continuity to ground.
- c. Connect shielded instrumentation cables to a calibrated 4 to 20 mADC signal transmitter and receiver. Test at 4 and 20 milliamp transmitter settings.
- d. Cable that fails a test shall be replaced with a new cable for its full length.

4. Grounding System:

- a. Test completed ground systems for resistance to ground using an electrical three terminal ground resistance tester. Test all grounded cables and metal parts for continuity of connection. Testing shall be witnessed by ENGINEER and OWNER.
- b. The grounding system maximum resistance shall not exceed five ohms under normally dry conditions when measured by the resistance tester. Resistance values above five ohms shall be brought to ENGINEER's attention. Provide additional ground rods if necessary to attain a resistance to ground of less than five ohms for each ground grid. A grounding additive shall be added when installing the additional ground rods to increase their effectiveness.
- c. Perform acceptance testing of the grounding system. Testing shall be performed by the testing firm in accordance with the latest NETA Acceptance Testing Specifications.

5. Operation Tests:

- a. Operate all starters, circuit breakers and associated equipment to demonstrate suitability and compliance with Specifications and reference standards, except for short circuit interrupting rating or other inherent design features covered by shop tests.
- b. Test all motors for direction of rotation and reverse connections if necessary.
- c. Check control circuits to determine that operation and sequence are correct and adjust limit switches, pressure switches, float switches, timers and other devices to give proper operation.

+ + END OF SECTION + +

SECTION 31 20 00

EARTH MOVING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform all excavating, filling, and grading, and disposing of earth materials as shown, specified, and required for construction of structures, Underground Facilities, roads, and other facilities required to complete the Work.
2. Preparation of subgrade for slabs and pavements is included under this Section.

B. Related Sections:

1. Section 02 41 00, Demolition.
2. Section 33 05 13, Manholes and Structures.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/AISC 360, Specification for Structural Steel for Buildings.
2. ASTM D422, Test Method for Particle-Size Analysis of Soils.
3. ASTM D698, Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
4. ASTM D1556, Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
5. ASTM D1557, Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
6. ASTM D2216, Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
7. ASTM D4253, Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
8. ASTM D4254, Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
9. ASTM D4318, Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
10. ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
11. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.

1.3 TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
 - 1. “Subgrade” is the uppermost surface of native soil material unmoved from cuts; the bottom of excavation.

1.4 SUBMITTALS (NOT USED)

1.5 SITE CONDITIONS

- A. Subsurface Information: The Supplementary Conditions indicate information available relative to subsurface conditions at the Site. Such information and data is not intended as a representation or warranty of continuity of conditions between soil borings or test pits, nor of groundwater levels at dates and times other than date and time when measured, nor that purpose of obtaining the information and data were appropriate for use by CONTRACTOR. OWNER will not be responsible for interpretations or conclusions drawn therefrom by CONTRACTOR.
- B. Soil borings and other exploratory operations may be made by CONTRACTOR, at no additional cost to OWNER. Coordinate CONTRACTOR-performed test borings and other exploratory operations with OWNER and utility owners as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of OWNER or utility owners. Comply with Laws and Regulations relative to required notifications.
- C. Existing Structures:
 - 1. The Contract Documents show or indicate certain structures and Underground Facilities adjacent to the Work. Such information was obtained from existing records and is not guaranteed to be correct or complete. CONTRACTOR shall explore ahead of the excavation to determine the exact location of all existing structures and Underground Facilities. Existing structures and Underground Facilities shall be supported and protected from damage by CONTRACTOR. Immediately repair and restore existing structures and Underground Facilities damaged by CONTRACTOR without additional cost to OWNER.
 - 2. Movement or operation of construction equipment over Underground Facilities shall be at CONTRACTOR’s sole risk and only after CONTRACTOR has prepared and submitted to ENGINEER and utility owners (as applicable), and received acceptance therefrom, a plan describing CONTRACTOR’s analysis of the loads to be imparted and CONTRACTOR’s proposed measures to protect structures and Underground Facilities during the Project.

3. Coordinate with utility owners for shut-off of services in active piping and conduits. When required by utility owner, OWNER will assist CONTRACTOR with utility owner notifications. Completely remove buried piping and conduits indicated for removal and not otherwise indicated as being abandoned or to remain in place.
4. In general, service lines and laterals to individual houses and businesses are not shown; however, CONTRACTOR shall assume that a service exists for each utility owner to each house, business, and property.
5. Do not interrupt existing utilities serving facilities occupied and used by OWNER or others, except when such interruption is indicated in the Contract Documents or when allowed in writing by ENGINEER after acceptable temporary utility services are provided by CONTRACTOR for the affected structure or property.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General Fill:

1. Material shall be free of: rock and gravel larger than three inches in any dimension, debris, waste, frozen materials, organic material, and other deleterious matter.
2. Fill shall have a liquid limit not greater than 45, and plasticity index not greater than 25.
3. Previously-excavated materials complying with the Contract Documents requirements for general fill may be used for general fill.
4. When on-Site materials are found unsuitable for use as general fill, provide select fill or approved off-Site general fill materials. Prior to using off-Site material as general fill, furnish submittal for and obtain ENGINEER's approval of the material proposed for use.

PART 3 – EXECUTION

3.1 INSPECTION

- #### A.
- Provide ENGINEER with sufficient notice and with means to examine areas and conditions under which excavating, filling, and grading will be performed. ENGINEER will advise CONTRACTOR in writing when ENGINEER is aware of conditions that may be detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 DEWATERING

A. Dewatering – General:

1. Provide and maintain adequate drainage and dewatering equipment to remove and dispose of all surface water and ground water entering excavations, or other parts of the Work and work areas. Keep each excavation dry during excavation, subgrade preparation, and continually thereafter until the structure to be built therein is acceptable to ENGINEER and backfilling operations are completed and acceptable to ENGINEER.
2. Keep all working areas at the Site free of surface water at all times. Provide temporary drainage ditches and temporary dikes, and provide required temporary pumping and other work necessary for diverting or removing rainfall and all other accumulations of surface water from excavations and fill areas. Perform diversion and removal of surface water in manner that prevents accumulation of water behind permanent or temporary structures and at any other locations in the construction area where such accumulations may be detrimental.
3. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the surface water or groundwater downstream of the point of discharge, shall not be directly discharged. Divert such waters through temporary settling basin or filter before discharging to surface water, groundwater, or drainage routes.
4. CONTRACTOR shall be responsible for condition of piping, conduits, and channels used for drainage and such piping, conduits, and channels shall be clean and free of sediment.
5. Remove water from excavations as fast as water collects.

3.3 EXCAVATION

A. Perform all excavation required to complete the Work as shown, specified, and required. Excavations shall include removing and handling of earth, sand, clay, gravel, hardpan, soft, weathered or decomposed rock, pavements, rubbish, and other materials within the excavation limits. Where the excavation includes rock that requires drilling, or specialized equipment for removal, notify ENGINEER.

B. Excavation Protection:

1. Provide excavation protection system(s) in accordance with Laws and Regulations to prevent injury to persons and property, including Underground Facilities.
2. Excavation Less Than Five Feet Deep: Excavations in stable rock or in soil conditions where there is no potential for a cave-in may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
3. Excavations Greater Than Five Feet Deep: Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.

- C. Maintain excavations in dry condition in accordance with “Dewatering” Article in Part 3 of this Section.
- D. Elevation of bottom of buried structures shown is approximate. ENGINEER may direct such minor changes in dimensions and elevations as may be required to secure a satisfactory footing.
- E. When excavations are made below required grades without written order of ENGINEER, fill such excavations with compacted general fill, as directed by ENGINEER, at CONTRACTOR’s expense.
- F. Extend excavations sufficiently on each side of structures, footings, and similar construction to allow setting of forms, installation of excavation supports, and the safe sloping of banks, as necessary.
- G. Subgrades – General:
 - 1. Subgrades shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades that are otherwise solid but become soft or mucky on top due to construction operations shall be reinforced with general fill. Finished elevation of stabilized subgrades shall not be above subgrade elevations shown.
 - 2. If, in ENGINEER’s opinion, subgrade becomes softened or mucky because of construction delays, failure to dewater properly, or other cause within CONTRACTOR’s control, subgrade shall be excavated to firm material, trimmed, and backfilled with select fill material at CONTRACTOR’s expense.

3.4 UNAUTHORIZED EXCAVATION

- A. All excavations outside lines and grades shown or indicated and that are not approved by ENGINEER, together with removing and disposing of the associated material, shall be at CONTRACTOR's expense. Fill unauthorized excavations with properly-compacted select fill material at CONTRACTOR’s expense.

3.5 EROSION AND SEDIMENT CONTROLS

- A. Provide temporary erosion and sediment controls in accordance with Section 01 57 05, Temporary Controls. When applicable, also comply with requirements of the erosion and sediment control plan approved by authorities having jurisdiction.

3.6 SHEETING, SHORING, AND BRACING

- A. General:
 - 1. Provide sheeting, shoring, bracing, and similar excavation supports as shown, specified, and required for the Work.

2. CONTRACTOR is responsible for adequacy of all sheeting, shoring, bracing, and similar excavation supports.
 3. Materials:
 - a. Previously-used materials shall be in good condition, and shall not be damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary sheeting, shoring, and bracing.
 - b. All steel work for sheeting, shoring, bracing, cofferdams and other excavation supports, shall be in accordance with ANSI/AISC 360, except that field welding will be allowed.
 4. As excavation progresses, carry down shoring, bracing, and similar excavation supports to required elevation at bottom of excavation.
 5. Comply with Laws and Regulations regarding sheeting, shoring, bracing, and similar excavation supports.
 6. Maintain sheeting, shoring, bracing, bracing, and other excavation supports in excavations regardless of time period excavations will be open.
 7. Unless otherwise shown, specified, or directed, remove materials used for temporary construction when the Work is completed. Perform such removal in manner not injurious to the structures and Underground Facilities, their appearance, and adjacent construction.
- B. Removal of Sheeting and Bracing:
1. Remove sheeting and bracing from excavations, unless otherwise directed by ENGINEER in writing. Perform removal to avoid damaging the Work and adjacent construction. Removal shall be equal on both sides of excavation to ensure no unequal loads on structures and Underground Facilities.
 2. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete, until the following conditions are satisfied:
 - a. Concrete has cured for not less than seven days.
 - b. Wall and floor framing, up to and including grade level floors, is in place.

3.7 TRENCH SHIELDS

- A. Excavation of earth material below bottom of trench shield shall not exceed the limits established in Laws and Regulations.
- B. When using a shield for installing piping:
1. Portions of trench shield extending below the mid-diameter of an installed, rigid pipe, such as prestressed concrete pipe and other types of rigid pipe, shall be raised above the pipe's mid-diameter elevation prior to moving the shield along the trench for further construction.
 2. Bottom of shield shall not at any time extend below mid-diameter of installed pipe that is flexible or has flexing capability, such as steel, ductile iron, PVC, CPVC, polyethylene, and other pipe that has flexing capability.

- C. When using a shield for installing structures, bottom of the shield shall not extend below the top of the bedding for the structures.
- D. When removing the shield or moving the shield ahead, exercise extreme care to prevent moving piping, structures, and other Underground Facilities, and prevent disturbance of bedding material for piping, structures, and other Underground Facilities. When piping, structures, or Underground Facilities are disturbed, remove and reinstall the disturbed items in accordance with the Contract Documents.

3.8 FILL AND COMPACTION – GENERAL PROVISIONS

- A. Provide and compact all fill required for the finished grades as shown and as specified in this Section.
- B. Place fill in excavations as promptly as progress of the Work allows, but not until completing the following:
 - 1. ENGINEER's authorization after observation of construction below finish grade, including dampproofing, waterproofing, perimeter insulation, and similar Work.
 - 2. Inspection, testing, approval, and recording of locations of Underground Facilities.
 - 3. Removal of concrete formwork.
 - 4. Removal of shoring and bracing, and filling of voids with satisfactory materials.
 - 5. Removal of trash and debris.
 - 6. Permanent or temporary horizontal bracing is in place on horizontally-supported walls.
- C. Fill that includes organic materials or other unacceptable material shall be removed and replaced with approved fill material in accordance with the Contract Documents.
- D. Placement – General:
 - 1. Place fill to the grades shown or indicated. Bring up evenly on all sides fill around structures and Underground Facilities.
 - 2. Place fill materials at moisture content and density as specified in this Article's requirements on compaction density. Furnish and use equipment capable of adding measured amounts of water to the fill materials to bring fill materials to a condition within required moisture content range. Furnish and use equipment capable of discing, aerating, and mixing the fill materials to ensure reasonable uniformity of moisture content throughout the fill materials, and to reduce moisture content of borrow materials by air drying, when necessary. When subgrade or lift of fill materials requires moisture-conditioning before compaction, fill material shall be sufficiently mixed or worked on the subgrade to ensure uniform moisture content throughout the

lift of material to be compacted. Materials at moisture content in excess of specified limit shall be dried by aeration or stockpiled for drying.

3. Perform compaction with equipment suitable for the type of fill material placed. Select and use equipment capable of providing the minimum density required in the Contract Documents. Use light compaction equipment, with equipment gross weight not exceeding 7,000 pounds within horizontal distance of ten feet from the wall of completed, below-grade structures. Furnish and use equipment capable of compacting in restricted areas next to structures and around piping and Underground Facilities. Effectiveness of the equipment selected by CONTRACTOR shall be tested at start of compacted fill Work by constructing a small section of fill within the area where fill will be placed. If tests on the test section of fill indicate that required compaction is not obtained, do one or more of the following: increase the amount of coverages, decrease the lift thicknesses, or use different compactor equipment.
4. Place fill materials in horizontal, loose lifts, not exceeding specified uncompacted thickness. Place fill in a manner ensuring uniform lift thickness after placing. Mechanically compact each lift, by not less than two complete coverages of the compactor. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of compactor's compacting surface. Compaction of fill materials by inundation with water is unacceptable.
5. Do not place fill materials when standing water is present on surface of the area where fill will be placed. Do not compact fill when standing water is present on the fill to be compacted. Do not place or compact fill in a frozen condition or on top of frozen material. Fill containing organic materials or other unacceptable material previously described shall be removed and replaced prior to compaction.
6. If required densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly-functioning compaction equipment, CONTRACTOR shall perform all work required to provide the required densities. Such work shall include, at no additional cost to OWNER, complete removal of unacceptable fill areas and replacement and re-compaction until acceptable fill is provided.
7. Repair, at CONTRACTOR's expense, observed or measured settlement. Make repairs and replacements as required within 30 days after being so advised by ENGINEER.

E. Fill Against Concrete:

1. Placing fill against concrete below finished grade is not allowed until the concrete has attained its specified strength, as determined by duration of concrete curing and testing of field-cured concrete cylinders. Requirements for strength and curing time are in Section 03 30 00, Cast-in-Place Concrete.
2. Elevation of fill placed against concrete walls shall not differ by more than two feet on each side of walls, unless walls are adequately braced or all floor framing is in place up to and including grade level slabs.

3. Backfill structural foundation units as soon as practicable, in accordance with this Section, after concrete has gained sufficient strength to avoid damage, to avoid ponding of surface water and accumulation of debris.
 4. Where fill is placed against waterproofed surface, exercise care that waterproofing material is not damaged.
- F. Temporary Pavement:
1. Place 1.5 inches of temporary asphalt concrete pavement immediately after filling excavations in paved roadways and other paved areas that will remain for permanent use.
 2. Maintain surface of paved area over the fill in good and safe condition during progress of the Work, and promptly fill depressions over and adjacent to the fill area caused by settlement of fill.
 3. Permanent replacement pavement shall be equal to that of the existing roadways, unless otherwise shown or specified.
- G. Subbase Placement:
1. Provide subbase material where shown to the limits shown or indicated.
 2. Place subbase material in compacted lifts not exceeding depth of six inches each.
- H. Drainage Fill Placement:
1. Provide drainage fill material where shown to the limits shown or indicated.
 2. Place drainage fill material in compacted layers of uniform thickness not exceeding depth of six inches each. Compact lifts of drainage fill using suitable compaction equipment.
- I. Replacement of Unacceptable Excavated Materials: In cases where over-excavation to replace unacceptable soil materials is required, backfill the excavation to required subgrade with select fill material and thoroughly compact in accordance with the "Compaction Density Requirements" in this Article. Slope the sides of excavation in accordance with the maximum inclinations specified for each structure location.

3.9 GRADING

- A. General:
1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
 2. Smooth subgrade surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free of irregular surface changes, and shall comply with the following:

1. Grassed Areas or Areas Covered with Gravel, Stone, Wood Chips, or Other Special Cover: Finish areas to receive topsoil or special cover to within not more than one inch above or below the required subgrade elevations.
 2. Sidewalks: Shape surface of areas under sidewalks to line, grade, and cross section, with finish surface not more than one inch above or below the required subgrade elevation.
 3. Pavements: Shape surface of areas under pavement to line, grade, and cross section, with finish surface not more than 1/2-inch above or below the required subgrade elevation.
- C. Grading Surface of Fill Under Concrete Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a ten foot straight edge.
- D. Compaction:
1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.10 PAVEMENT SUBBASE COURSE

- A. General:
1. Place subbase material, in layers of specified thickness, over ground surface to support pavement base course.
 2. After completing filling and grading, shape and compact pavement subgrade to an even, firm foundation in accordance with this Section. Remove unsuitable subgrade materials, including soft materials, boulders, vegetation, and loose stones, and replace with compacted fill material as directed by ENGINEER.
- B. Grade Control:
1. During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Placing of Pavement Subbase Course:
1. Place subbase course material on prepared subgrade in layers of uniform thickness, in accordance with indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placing operations.
 2. After completing compaction, other than that necessary for bringing material for the next course, do not haul or drive over the compacted subbase.
 3. Do not install pavement subbase in excess of 500 feet in length without compacting to prevent softening of the subgrade.
 4. If subgrade material becomes churned up into or mixed with the subbase material, remove the mixed material and replace with clean, compacted subbase material.

3.11 DISPOSAL OF EXCAVATED MATERIALS

A. General:

1. CONTRACTOR shall haul away material removed from excavations that does not comply with requirements for fill, or is in excess of the quantity required for fill.
2. Disposal of materials shall be in compliance with Laws and Regulations, at no additional cost to OWNER.

+ + END OF SECTION + +

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SECTION 31 23 05

BACKFILL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and place crushed stone, excavated material, pipe bedding, and concrete encasement of the types specified, at locations shown, and as ordered by the ENGINEER.

1.2 RELATED SECTIONS

- A. Section 32 12 00, Flexible Paving.
- B. Section 33 05 05, Buried Piping Installation.

1.3 REFERENCE STANDARDS

- A. Standards referenced in this Section are listed below:
 - 1. ANSI/ASTM C 136 – Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ANSI/ASTM D 698 – Test Methods for Moisture – Density Relations of Soils and Soil-Aggregate Mixtures, using 5.5-pound Rammer and 12-inch (304.8 millimeters) Drop.
 - 3. ASTM D422, Method for Particle-Size Analysis of Soils.
 - 4. ASTM D427, Test Methods for Shrinkage Factors of Soils by the Mercury Method.
 - 5. ASTM D557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft 16/cu ft) (2,700 KN-m/cum).
 - 6. ASTM D2166, Test Method for Unconfined Compressive Strength of Cohesive Soils.
 - 7. ASTM D2922, Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 8. ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - 9. ASTM D1556, Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 10. ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft 16/cu ft) (2,700 KN-m/cum).
 - 11. ASTM D2922, Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

12. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section .650 (Subpart P - Excavations).
13. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
14. Table 3.1 Description of Embedment Material Classifications, Buried Pipe Design, A.P. Moser, 2001.

1.4 SUBMITTALS

- A. Certifications regarding products.
- B. Product Data: Submit source of materials and, when gradation is specified, submit gradation test report for each type of material specified and test reports regarding products and compaction.
- C. Flowable fill design mixtures, samples, and independent laboratory testing data showing material meets strength requirements and does not leach any constituents in excess of regulatory standards.
- D. Samples – Provide 1 pound samples of all borrowed backfill materials proposed for use in heavy weight Zip-Loc bags.
- E. Field quality control testing results
- F. Independent Testing Laboratory name and certifications

PART 2 - PRODUCTS

2.1 COMMON FILL

- A. No ashes, putrescible refuse, wood, stones larger than 6-inches, roots, frozen materials, or other material of an unsatisfactory character shall be used in backfilling. All suitable, defined as Class I through IV by Moser, excess material from trenches and other excavations may be used. In the event that additional material is needed, obtain borrow material from other sources. All borrow material shall be of satisfactory quality for required purposes. In certain locations, grading and filling of adjacent ground may be required or directed by the OWNER.

2.2 SELECT FILL

- A. No ashes, putrescible refuse, wood, stones larger than 3-inches, roots, frozen materials, or other material of an unsatisfactory character shall be used in backfilling. All suitable, defined as Class I, II, or III by Moser, excess material from trenches and other excavations may be used. In the event that additional material is needed obtain borrow material from other sources. All borrow material shall be of satisfactory quality for required purposes and shall be supplied by a MassDOT approved source. In certain locations, grading and filling of adjacent ground may be required or directed by the OWNER.

2.3 AASHTO #8

- A. Natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
½-inch	100
3/8-inch	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

2.4 AASHTO #57

- A. Coarse stone, crushed gravel, pit run, angular, washed, natural stone, free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 ½-inch	100
1-inch	95 to 100
½-inch	25 to 60
No. 4	0 to 10
No. 8	0 to 5

2.5 SAND

- A. Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

2.6 AASHTO #1

- A. Cobbles, free of fines, clean washed stone, graded in accordance with ANSI/ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
4-inch	100
3 ½-inch	90 to 100
2 ½-inch	25 to 60
1 ½-inch	0 to 15
¾-inch	0 to 5

2.7 AASHTO #3

- A. Coarse stone, angular, washed, free of shale, clay, friable material, sand debris; graded in accordance with ANSI/ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 ½-inch	100
2-inch	90 to 100
1 ½-inch	35 to 70
1-inch	0 to 15
½-inch	0 to 5

2.8 CRUSHER RUN

- A. Crusher run stone or crusher run slag shall have physical properties and characteristics in accordance with ANSI/ASTM C136 within the following limits.

<u>Sieve Size</u>	<u>Percent Passing</u>
1 ½-inch	100
¾-inch	50 to 90
No. 4	20 to 50
No. 10	15 to 40
No. 200	0 to 15

2.9 TYPE C

- A. Material shall be graded in accordance with ANSI/ASTM C136 within the following limits.

<u>Sieve Size</u>	<u>Percent Passing</u>
1-inch	85 to 100
No. 200	0 to 25

- B. Offsite borrow Type C shall be supplied by a DELDOT approved source.

2.10 AASHTO #67

- A. Coarse stone, gravel, angular, washed, natural stone, free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-inch	100
¾-inch	90 to 100
3/8-inch	20-55
No. 4	0 to 10
No. 8	0 to 5

2.11 CLSM – BACKFILL MATERIAL

- A. Controlled low strength material (CLSM or flowable fill) shall be a uniform mixture of sand, Type II Portland cement, fly ash, admixtures, and water. The mix design shall produce a flowable material with little or no bleed water which produces a minimum compressive strength of 35 psi and maximum compressive strength of 150 psi at 28 days. The cured material shall be excavatable and have a maximum density of 100 pounds per cubic foot. Slump shall be from 7-inches to 10-inches.

- B. Admixtures specifically designed for flowable fill shall be used to improve flowability, reduce unit weight, control strength development, reduce settlement, and reduce bleed water.
- C. Sample and perform all tests of CLSM delivered to the site in accordance with ASTM D5971 prior to placement as a bedding material.

2.12 CLSM – ABANDONED PIPE/ANNULAR SPACE FILL MATERIAL

- A. CLSM shall be a uniform mixture of sand, Type II Portland cement, fly ash, admixtures, and water. The mix design shall produce a flowable material with little or no bleed water which produces a minimum unconfined compressive strength of 20 psi and a maximum unconfined compressive strength of 80 psi at 28 days. The cured material shall be excavatable and have a maximum density of 100 pounds per cubic foot. Slump shall be from 7-inches to 10-inches.
- B. Admixtures specifically designed for flowable fill shall be used to improve flowability, reduce unit weight, control strength development, reduce settlement, and reduce bleed water.

2.13 PORTLAND CEMENT CONCRETE CLASS B

- A. DelDOT Class B Portland cement concrete

Minimum 28 Day Compressive Strength	3000 psi
Cement Content Minimum	564 lbs/yd
Water to Cement Ratio	.45
Required Air Content	4-7%
Required Slump	2-4 inches
Required Admixtures	Per AASHTO M 194

2.14 RIPRAP

- A. Rip-rap shall be National Stone Association No. R-5. Graded rock size shall be a minimum of 5 inches, a maximum of 18 inches and an average (d50) of 9 inches. At least 50% of the individual stone particles must equal or larger than the d50 size.

PART 3 -EXECUTION

3.1 INSPECTION

- A. Provide ENGINEER with sufficient notice and with means, including provisions for safely entering an excavation, to examine the areas and conditions under which back filling and grading are to be performed.
- B. Uncover any backfilling performed without authorization at no additional cost to OWNER.

3.2 GENERAL BACKFILLING AND COMPACTION

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Remove materials such as boulders, etc. from native materials to meet general or select backfill specifications when such constituents constitute less than 5 percent of the volume of the native material.
- C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- D. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation dampproofing, foundation waterproofing, and protective pipe coatings.
- E. Compact the subbase and haunch area in accordance with paragraph 3.12 and in accordance with piping installation specifications.
- F. Backhoe or excavator buckets or other similar devices shall not be used for compaction purposes. Utilize mechanical or hand devices specifically designed for compaction such as rollers or tampers.
- G. Maintain optimum moisture content of backfill materials to attain required compaction density.
- H. Place Class I and Class II backfill materials in 12 inch maximum loose lifts. Place Class III backfill materials in 6 inch maximum loose lifts.
- I. Remove surplus backfill materials from site.
- J. Backfill all excavations as rapidly as practicable, following inspection and approval of work by the ENGINEER.
- K. No part of a pipeline or other structure that needs to be located, inspected, or measured shall be filled over or around until required inspections have been made by the ENGINEER and ENGINEER has given permission to backfill.
- L. Any backfilling done without authorization shall be uncovered by the CONTRACTOR at his own expense.
- M. Repair any settlement that occurs within six months of the Work or such longer guaranty period required for the Work.

3.3 PIPE BEDDING

- A. Bed pipe as specified in Section 33 05 05 and as shown on Drawings

3.4 CONCRETE ENCASEMENT

- A. Where required, the pipe shall be supported by concrete encasement.
- B. The total minimum width of the concrete encasement shall equal the width of trench excavation. Unless otherwise shown on the Drawings or specified herein, concrete shall be Class B. Where specified on the Drawings, install reinforcing steel the length of the encasement to 6 inches from ends of encasement. For metallic pipe, use non-conducting rebar hanger insulators to prevent dielectric contact with pipe wall. No backfilling of the trench shall begin until concrete has hardened to a strength of at least 500 psi.
- C. Take measurements to ensure pipe does not float during placement and curing of concrete.

3.5 TRENCH BACKFILLING IN AREAS TO BE PAVED

- A. From the top of pipe bedding to the top of paving subbase, backfill the excavation with fill satisfying the requirements shown on the Drawings and compact by tamping or rolling. Evenly spread the backfill material in layers not exceeding 12-inches unless otherwise shown on the Drawings before tamping or power rolling.

3.6 TRENCH BACKFILLING IN UNPAVED AREAS

- A. From the top of pipe bedding to the subgrade of topsoil or grade, as appropriate, backfill the excavation with fill satisfying the requirements shown on the Drawings and compacted by tamping or rolling. Evenly spread the backfill material in layers not exceeding 12-inches unless otherwise shown on the Drawings before tamping or power rolling.

3.7 KEYHOLE BACKFILLING

- A. When backfilling excavations less than five square feet in area, backfill the excavation with fill satisfying the requirements shown on the Details and compact by tamping or rolling. Evenly spread the backfill material in layers not exceeding 12-inches before tamping. Introduce water to each lift as necessary to ensure maximum compaction.

3.8 PAVEMENT SUBBASE COURSE

- A. Place subbase material in layers of specified or shown thickness to support pavement binder course as specified in Section 32 12 00.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness. Maintain optimum moisture content for compacting subbase material during placement operations. When a compacted subbase course is shown to be 6-inches thick or less, place material in a single layer. When shown to be more than 6-inches thick, place material in equal layers, except no single layer shall be more than 6-inches or less than 3-inches in thickness when compacted.

3.9 PLACEMENT OF CLSM

- A. CLSM shall be batched and premixed by an approved producer dispensed from ready-mix trucks, and placed by approved methods and equipment.
- B. CLSM shall be placed so as to completely fill the space to receive it with no trapped air pockets or other voids. Positive means of allowing air to escape shall be provided where necessary. Where placed against and around existing structures, lift heights shall be limited so as to not overload the structure. Lift heights shall be less than 18 inches.
- C. Where CLSM is placed around piping and other elements subject to floating within the fill, provide temporary balancing loads to prevent uplift or fill lift height shall be limited to prevent uplift.
- D. Application of loads or placement of other fill materials or concrete on top of CLSM shall not occur until the CLSM has achieved 75% of minimum design strength.
- E. Provide all facilities as may be necessary for the ready procurement of samples of CLSM from the work or truck mixers as required by ENGINEER for test purposes.
- F. CLSM used to fill abandoned pipe shall be tremie-pumped into place.

3.10 TOLERANCES

- A. Top surface of backfilling under paved areas: plus or minus 1-inch from required elevations.

3.11 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed by an independent laboratory retained by the ENGINEER. Or retained by the CONTRACTOR or Provide compaction testing, as CONTRACTOR deems appropriate to ensure his own Work.. ENGINEER may perform additional compaction testing at his discretion.
- B. Compaction testing will be performed in accordance with ASTM D422, ASTM D427, ASTM D1556, ASTM D1557, ASTM D2166, ASTM D2922, and ASTM D4318. Test reports shall include date taken, location (Manhole – Manhole/Station), moisture content, optimum moisture, dry density, maximum density, and percent compaction. Additionally, the locations of tests shall be plotted on the profile view of the approved Drawings at the depth and station they were taken.
- C. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost to OWNER.
- D. Proof roll compacted fill surfaces under slabs-on-grade, pavers, and paving.
- E. Provide air gap (1/2" +/-) between bell and pipe bedding material underneath. Do not shovel slice bell holes.
- F. No compaction testing is required for pipe bedding material placed in accordance with the drawings as determined by the ENGINEER.
- G. Compaction testing shall be as follows:

1. One test per 200 linear feet of trench and fraction thereof per lift.
 2. One test per 1000 square feet and fraction thereof for general grading.
 3. One test per every second lift for manhole construction around all pipe penetrations and every 3 feet of depth otherwise.
- H. Additional testing shall be as follows:
1. One slump and one UCS test per encasement.
 2. One slump and one UCS test per pour of flowable backfill.
 3. Additional tests as directed by the ENGINEER.
- I. ENGINEER or ENGINEER's testing service shall inspect subgrades and fill layers and verify that test results conform to the Contract Documents before further construction Work is performed thereon.
- J. Using of testing services shall not relieve CONTRACTOR of responsibility to provide Work in full compliance with the Contract Documents.
- K. To facilitate testing services, CONTRACTOR shall:
1. Secure and deliver to ENGINEER or to testing agency, without cost, preliminary representative Samples of materials CONTRACTOR proposes to use and that are required to be tested.
 2. Furnish such casual labor as necessary to obtain and handle Samples at the Site and at material sources.
 3. Advise ENGINEER's testing agency at least two days in advance of backfilling operations, to allow for completion of quality tests and for assignment of personnel.
 4. Demonstrate to ENGINEER adequacy of compaction equipment and procedures before exceeding 200 linear feet of trench backfill.
 5. Until specified compaction of previously compacted earthwork is achieved, do not perform further earthwork of the same kind.
 6. If compaction does not conform to the Contract Documents, remove backfill and replace backfill at proper density, or bring density to specified level by other means acceptable to ENGINEER.

3.12 COMPACTION REQUIREMENTS

- A. The minimum density for all trench backfill, pipe bedding, and fill beneath and within 12-feet of structures and in roadways shall be 95 percent of the maximum density (Modified Proctor Density) obtained in the laboratory in accordance with ASTM D1557 Method C, including Note 2.
- B. The minimum density for all trench backfill, pipe bedding and fill within landscaped areas, rights-of-way, backyards more than 12-feet beyond any structure shall be 90 percent of the maximum density (Modified Proctor Density) obtained in the laboratory in accordance with ASTM D1557 Method C, including Note 2.

- C. If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, perform whatever work is required to provide the required densities. This work shall include complete removal of unacceptable fill areas and replacement and recompaction until acceptable fill is provided.
- D. Where pipe is laid in rock excavation, carefully place and tamp crushed stone or gravel fill over the rock before the pipe is laid. Depth of crushed stone or gravel shall be at least 6-inches for pipe 16-inches and smaller and 9-inches for pipe 18-inches and larger unless otherwise shown on the Drawings. After laying pipe, place the balance of the backfill as described above.

3.13 GRADING

- A. General: Uniformly grade areas within limits of grading shown or specified, including adjacent transition areas. Smooth subgrade surface within specified tolerances, complete with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Turfed Areas: Finish areas to receive topsoil to within not more than 1-inch above or below the required subgrade elevations.
- C. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1-inch above or below the required subgrade elevation.
- D. Pavements: Shape surface of areas under pavements to line, grade and cross-section, with finish surface not more than 1-inch above or below the required subgrade elevation.
- E. Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½-inch when tested with a 10-foot straightedge.
- F. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density required.

+ + END OF SECTION + +

SECTION 31 23 16.13

TRENCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform all excavating, backfilling, filling and grading, and disposing of earth materials as shown, specified, and required for constructing utilities as required to complete the Work.
2. The following are included in the Work under this Section:
 - a. Earthwork for roads and drives, walks, grading, structures, and other Work required.
 - b. Preparing subgrade.
 - c. Preventing discharge into surface waters of sediment from excavation dewatering systems, and erosion controls.
3. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof, including rock removal.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.
2. ASTM A36, Specification for Structural Steel.
3. ASTM A328, Specification for Steel Sheet Piling.
4. ASTM D422, Method for Particle-Size Analysis of Soils.
5. ASTM D427, Test Methods for Shrinkage Factors of Soils by the Mercury Method.
6. ASTM D1556, Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
7. ASTM D 557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft 16/cu ft) (2,700 KN-m/cum).
8. ASTM D2166, Test Method for Unconfined Compressive Strength of Cohesive Soils.
9. ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
10. ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 QUALITY ASSURANCE

A. Permits and Regulations:

1. Obtain necessary permits for Work in roads, rights-of-way, railroads, and other property where permits are required. Obtain permits as required by local, state, and federal authorities having jurisdiction for discharging water from excavations.
2. Perform excavation Work in compliance with requirements of authorities having jurisdiction.
3. Comply with OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Subpart P – Excavations.

B. Requirements for testing laboratories are in Part 3 of this Section.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Testing Plans, Procedures and Testing Limitations:
 - a. Excavation Plan: Prior to start of excavation operations, submit written plan to demonstrate compliance with OSHA Standard 29 CFR Part 1926.650. As a minimum, excavation plan shall include:
 - 1) Name of competent person.
 - 2) Excavation method(s) or protective system(s) to be used.
 - 3) Copies of “manufacturer's data” or other tabulated data if protective system(s) are designed on the basis of such data.
 - b. Submit plan for CONTRACTOR field quality control tests demonstrating compliance with field quality control requirements in this Section.
2. Special Procedure Submittals: Temporary Construction Measures:
 - a. CONTRACTOR shall prepare shop drawings for the following items:
 - 1) Sheet piling and bracing, or other protective system(s).
 - 2) Dewatering system.
 - 3) Cofferdams.
 - 4) Underpinning.
 - b. Drawings shall be prepared by a Registered Professional Engineer recognized as expert in the specialty involved. Drawings shall be submitted to ENGINEER for record purposes only. Calculations shall not be submitted. Drawing submittals will not be checked and will not imply approval by ENGINEER of the Work involved. CONTRACTOR shall be solely responsible for designing, installing, operating and maintaining whatever system is necessary to satisfactorily accomplish all necessary sheet piling, bracing, protection, underpinning and dewatering.

B. Informational Submittals: Submit the following:

1. Field Quality Control Submittals:

- a. Test Reports for Borrow, Backfill and Grading: Testing laboratory shall submit copies of the following reports directly to ENGINEER and copy to CONTRACTOR:
 - 1) Tests of borrow material.
 - 2) Tests of excavation subgrade, including footers.
 - 3) Field density tests.
 - 4) Optimum Moisture: Maximum density curve for each soil used for backfill.
 - 5) Tests of actual unconfined compressive strength or bearing tests of each strata.
 - b. Submit the proposed compaction procedure and equipment to be used.
 - c. Submit any additional reports from required field testing as specified in part 3 of this specification.
2. Qualifications Statements:
- a. Submit qualifications for earthwork testing agency.

1.5 SITE CONDITIONS

- A. Existing Facilities and Structures, Including Underground Facilities:
- 1. Call Mass Dig Safe, (888) 344-7233, at least 72 hours before excavation in each area of work.
 - 2. General: Refer to the General Conditions and Supplementary Conditions for requirements regarding existing facilities and structures.
 - 3. Service Lines: In general, utility service lines, whether Underground Facilities or overhead services, to individual residences, businesses, and other buildings are not shown. Assume that a service exists for each utility to each house or business.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS AND GRANULAR MATERIALS

- A. Select Fill:
- 1. Place select fill where shown or specified, and around and under foundations, tanks, pipelines, structures, roads, walks, and other Work.
 - 2. Use well graded granular material or bank-run gravel, free from organic matter.
 - 3. Gradation: Not more than 70 percent by weight shall pass through a No. 40 sieve; not more than 10 percent by weight shall pass through a No. 200 sieve; and 100 percent shall pass a four-inch square sieve.
 - 4. When required, submit Sample of material.
 - 5. Advise ENGINEER in writing of source.
- B. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, or natural or crushed sand.

- C. Drainage Fill: Washed, uniformly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1.5-inch sieve and not more than five percent passing a No. 4 sieve.
- D. General Backfill and Fill Materials: Provide soil materials for backfill and fill free of clay, and rock and gravel larger than four inches in any dimension, debris, waste, frozen materials, vegetable, and other organic matter and other deleterious materials. Previously excavated materials meeting these requirements may be used for backfill.
- E. Crushed Stone or Screened Gravel: The material shall be well graded, clean screened gravel or crushed stone obtained from an approved source. Maximum size shall be 1 ½ inches and 95 percent shall be retained on a No. 4 screen.
- F. Sand: Conform to ASTM C33 for fine aggregate.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Provide ENGINEER with sufficient notice and means to examine areas and conditions under which excavating, filling, and grading will be performed. ENGINEER will notify CONTRACTOR if conditions are believed to be detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 GENERAL

- A. Use of Explosives:
 - 1. Use of explosives is not allowed.
- B. Protection of Persons and Property: Barricade open excavations occurring as part of the Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 - 1. Protect structures, utilities, sidewalks, pavement, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork Work.
 - 2. Obtain written permission from property owner before removing, trimming, or disturbing trees, shrubs, plants, fences, rails, walks, structures or other facilities encountered on the line of the excavation.
- C. Existing Facilities and Structures, Including Underground Facilities:
 - 1. General: Refer to the General Conditions and Supplementary Conditions for requirements regarding existing facilities and structures.

2. Damage Incurred During the Work: Existing facilities or structures damaged by CONTRACTOR shall be immediately restored and repaired by CONTRACTOR to condition equal to or better than pre-construction condition to satisfaction of owner of the damaged facility or structure, at no additional cost to OWNER.
 3. Do not interrupt existing utilities except as otherwise specified or as allowed by owner of the utility. Comply with requirements of utility owner relative to providing temporary utility service as required.
 4. Removals: Unless otherwise shown or specified, demolish and completely remove from Site existing Underground Facilities indicated to be removed. Coordinate with respective utility owner for service shutoff if existing line(s) are active.
- D. Dust Control: Conduct all operations and maintain the Site, including sweeping and sprinkling of paved areas, to minimize creation and dispersion of dust and material tracked or deposited by construction vehicles.
- E. Roadways and Walks: Unless otherwise approved by ENGINEER and authorities having jurisdiction, excavated material and construction materials shall be stockpiled and the Work conducted to maintain open and free for pedestrian traffic all crosswalks and, for vehicular traffic, driving way not less than ten feet wide. All hydrants, valves, fire alarm boxes, letterboxes, and other facilities that may require access during construction shall be kept accessible for use. During the Work, maintain such crosswalks, sidewalks, and paved areas in satisfactory condition. The Work shall be conducted to cause minimum of inconvenience to public travel and shall allow safe and convenient access to private and public property along line of the Work.

3.3 TEST PITS

- A. General:
1. In advance of the construction, as necessary, CONTRACTOR shall excavate and backfill test pits to determine conditions or location of existing Underground Facilities. Perform all Work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling, replacing pavement, and restoring test pits as required.
 - a. CONTRACTOR shall be responsible for the definite location of each existing Underground Facility within the area of excavation for Work under the Contract. Exercise care during such location work to avoid damaging or disrupting the affected Underground Facility. CONTRACTOR shall be responsible for repairing, at CONTRACTOR's expense, damage of Underground Facilities caused by the Work.
- B. Payment for Test Pits:
1. Separate payment will not be made for test pits.

3.4 EXCAVATION

- A. Perform excavation required for the Work as shown and specified. Excavations shall include earth, sand, clay, gravel, hardpan, boulders not requiring drilling and blasting to remove decomposed rock, pavements, rubbish and all other materials within excavation limits, except rock.
- B. Excavations for structures and pipelines shall be open excavations. Provide excavation protection system(s) required by Laws and Regulations to prevent injury to workers and to prevent damage to new and existing structures and facilities. Unless otherwise shown or specified, utilize protection system(s) under the following conditions:
 - 1. Excavation Less Than Five Feet Deep: Excavations in stable rock or in soil conditions where there is no potential for a cave-in may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
 - 2. Excavations More Than Five Feet Deep: Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
 - 3. Excavation protection system(s) shall be provided and maintained in accordance with submittals specified in this Section.
- C. Where pipeline, utility, or structure is to be installed below groundwater table, provide wellpoints, cofferdams or other acceptable methods to allow construction of the Work in dry conditions. Dry conditions shall prevail until concrete has reached sufficient strength to withstand earth and hydrostatic loads, and until pipelines are properly jointed, successfully tested, and acceptably backfilled.
- D. Pumping of water from excavations shall prevent carrying away of unsolidified concrete materials, and prevent damage to existing subgrade.
- E. Trench Preparation:
 - 1. No more than 200 feet of trench may be opened in advance of pipe laying. Trenches in rock shall be fully opened at least 30 feet in advance of where pipe is being laid.
 - 2. Trench width shall be minimized to greatest extent practical, but shall conform to the following:
 - a. Sufficient to provide room for installing, jointing, testing, and inspecting piping, but in no case wider at top of pipe than outside diameter of pipe barrel plus two feet.
 - b. Enlargements at pipe joints may be made, if required and accepted by ENGINEER.
 - c. Sufficient for shoring and bracing, or shielding, and dewatering.
 - d. Sufficient to allow thorough compaction of backfill adjacent to bottom half of pipe.

- e. Do not use excavating equipment that requires trench to be excavated to excessive width.
 - f. Piping four inches in diameter and larger shall be excavated at least six inches below bottom of pipe and backfilled with pipe bedding material.
- 3. Depth of trench shall be as shown. If required and accepted by ENGINEER depths may be revised.
- F. Repair effects of settlement of fill, at no additional cost to the OWNER.
- G. Material Storage: Stockpile satisfactory excavated materials in acceptable areas until required for backfilling or filling. Place, grade, and shape stockpiles for proper drainage.
 - 1. Locate and retain soil materials away from edge of excavations.
 - 2. Dispose of excess soil material and waste materials as specified.
- H. When ENGINEER considers existing material beneath bedding material to be unsuitable, CONTRACTOR shall remove and replace it with select fill.

3.5 UNAUTHORIZED EXCAVATION

- A. Excavation outside lines and grades shown and that are not approved by ENGINEER, together with removal and disposal of associated material, shall be made, filled, and restored at CONTRACTOR's expense. Unauthorized excavations shall be filled and compacted with select fill or concrete. Claims and damages resulting from CONTRACTOR's unauthorized excavation will be CONTRACTOR's sole responsibility.

3.6 DRAINAGE AND DEWATERING

- A. General:
 - 1. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
 - 2. Remove water from excavations as fast as it collects.
 - 3. Maintain groundwater level below bottom of excavation to provide stable surface for construction operations, stable subgrade for the Work, and to prevent damage to Work during construction.
 - 4. Provide and maintain sumps, pumps, suction and discharge lines, and other dewatering system components and consumables to convey water away from excavations. Provide and maintain at the Site adequate operational standby equipment.
 - 5. Provide approved sediment traps when water is conveyed into watercourses.
 - 6. Obtain ENGINEER's acceptance before shutting down dewatering system for any reason.
- B. Standby Requirements for Dewatering: Provide standby equipment to ensure continuity of dewatering operations.

C. Disposal of Water Removed by Dewatering System:

1. Dispose of water removed from excavation in manner to avoid endangering public health, property, and the Work.
2. Dispose of water in manner avoid inconvenience to OWNER and others at and near the Site, and others in proximity to downstream drainage routes.
3. Convey water from excavation in closed conduit. Do not use trench excavations as temporary drainage ditches.

3.7 SHEETING, SHORING, AND BRACING

A. General:

1. Used material used for sheeting, shoring, or bracing shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary work.
2. Timber used for breast boards (lagging) shall be new or used, meeting requirements for Douglas Fir Dense Construction grade, with a bending strength not less than 1,500 psi, or Southern Pine No. 2 Dense.
3. Steel work for sheeting, shoring, bracing, cofferdams and other temporary measures shall be designed and built in accordance with the provisions of AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, except that field welding is allowed.
4. Steel sheet piling shall be manufactured from steel conforming to ASTM A328. Steel for soldier piles, wales, and braces shall be new or used and shall conform to ASTM A36.
5. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
6. Safe and satisfactory sheeting, shoring, and bracing shall be entire and sole responsibility of CONTRACTOR.
7. Unless otherwise shown, specified, or ordered, remove materials used for temporary construction when the Work is complete. Removal shall be made in manner not injurious to the Work.

- B. Removal of Sheeting and Bracing: Remove sheeting and bracing from excavation unless otherwise directed by ENGINEER. Removal shall be done to cause no injury to the Work.

3.8 TRENCH SHIELDS

- A. Excavation of earth material below bottom of trench shield shall not exceed limits established by Laws and Regulations.
- B. When using trench shield for piping installation:

1. Portion of shield extending below mid-diameter of an installed rigid or semi-rigid pipe (for example, pre-stressed concrete cylinder pipe) shall be raised above mid-diameter point prior to moving shield ahead to install next length of pipe.
 2. Bottom of trench shield shall not extend below mid-diameter of installed flexible pipe (for example, steel, ductile iron, PVC).
- C. When using trench shield while installing structures, bottom of shield shall not extend below top of bedding for the structure.
- D. When trench shield is removed or moved ahead, take extreme care to prevent movement of piping or structures and disturbing bedding of piping or structures. Remove piping or structures disturbed and reinstall as specified.

3.9 GENERAL REQUIREMENTS FOR BACKFILL, FILL, AND COMPACTION

- A. Furnish, place, and compact backfill required for trenches, structures, and to provide finished grades shown and specified. Unless otherwise specified, fill may be obtained from on-Site sources. Provide additional materials, if required, from off-Site sources, at no additional cost to OWNER.
- B. Backfill excavations as promptly as Work permits, but not until completion of the following:
1. Successful completion of all Work within the excavation.
 2. Inspections, successful completion and acceptance of testing, and recording of locations of Underground Facilities, including connections, branches, valves, structures, and other facilities.
 3. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off tops of temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of Underground Facilities, or leave in place if required.
 4. Removal of trash and debris.
- C. Keep excavations dry during backfilling operations. Evenly bring up backfill around all sides of piping and structures.
- D. Place backfilling in trenches below piping, foundations, or paved areas in horizontal layers each not exceeding six inches deep and thoroughly compact each before next layer is placed. In other pipe trenches, compacted layers shall be six inches up to pipe centerline and eight inches above pipe centerline.
- E. Where pipe is laid in rock excavation, specified granular material shall be carefully placed and tamped over the rock before piping is installed. Depth of granular material shall be at least six inches for pipe 16-inch diameter and smaller, and nine inches for pipe 18-inch diameter and larger. After laying pipe, place balance of backfill as described above in this Section.

3.10 GRADING

- A. General: Uniformly grade areas within limits of grading shown or specified, including adjacent transition areas. Smooth subgrade surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Turfed Areas: Finish areas to receive topsoil to within one inch above or below required subgrade elevations.
- C. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface within one inch above or below required subgrade elevation.
- D. Pavements: Shape surface of areas under pavements to line, grade, and cross-section, with finish surface within 1/2-inch above or below required subgrade elevation.
- E. Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within 1/2-inch when tested with ten-foot-long straight edge.
- F. Compaction: After grading, compact subgrade surfaces to depth and percentage of maximum density required.

3.11 PAVEMENT SUBBASE COURSE

- A. General: Place subbase material in layers of specified thickness over subgrade surface to support pavement base course.
 - 1. Refer to appropriate Division 32 Specification Sections for paving requirements.
- B. Grade Control: During construction maintain lines and grades, including crown and cross-slope of subbase course.
- C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least 12-inch width of shoulder simultaneously with compacting and rolling of each layer of subbase course.
- D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.
 - 1. When compacted subbase course is shown to be six inches thick or less, place material in single layer. When shown to be more than six inches thick, place

material in equal layers, except no single layer more than six inches or less than three inches thick when compacted.

3.12 DISPOSAL OF EXCAVATED MATERIALS

- A. Material removed from excavations that does not conform to requirements for fill or is in excess of that required for backfill, shall be removed from the Site and disposed of in compliance with Laws and Regulations at no additional cost to OWNER.

3.13 RESTORING AND RESURFACING EXISTING ROADWAYS AND FACILITIES

- A. For trenches in areas paved with bituminous concrete pavement, place 1.5 inches of temporary bituminous pavement immediately after backfilling trenches. Maintain surface of paved area over trench in good and safe condition during progress of the Work, and promptly fill all depressions over and adjacent to trench caused by settlement of backfill. Immediately prior to constructing permanent pavement and base, remove and dispose of temporary pavement. Permanent pavement shall be equal to that of existing adjacent pavement, unless otherwise shown or specified.
- B. Pavement, gutters, curbs, walks, driveways, and roadways disturbed or damaged by CONTRACTOR's operations, except areas designated as proposed pavement, shall be restored or replaced by CONTRACTOR at his expense to condition equal to or better than prior to start of the Work and in accordance with requirements of entity that owns the roadway or Site.

3.15 FIELD QUALITY CONTROL

- A. Testing Services:
 - 1. General: Testing of materials, testing for moisture content during placement and compaction of fill materials, and of compaction requirements for compliance with the Contract Documents shall be by a certified testing laboratory. Testing shall conform to: ASTM D422, ASTM D427, ASTM D1556, ASTM D1557, ASTM D2166, ASTM D6938, and ASTM D4318.
 - 2. Responsibilities and Duties of CONTRACTOR Relative to Testing:
 - a. Using of testing services shall not relieve CONTRACTOR of responsibility to provide Work in full compliance with the Contract Documents.
 - b. To facilitate testing services, CONTRACTOR shall:
 - 1) Secure and deliver to ENGINEER or to testing agency, without cost, preliminary representative Samples of materials CONTRACTOR proposes to use and that are required to be tested.
 - 2) Furnish such casual labor as necessary to obtain and handle Samples at the Site and at material sources.

- 3) Advise OWNER's testing agency at least two days in advance of backfilling operations, to allow for completion of quality tests and for assignment of personnel.
- c. CONTRACTOR's testing service shall inspect subgrades and fill layers and verify that test results conform to the Contract Documents before further construction Work is performed thereon.
- d. CONTRACTOR shall provide specified compaction for backfill, fill, and other earthwork. CONTRACTOR shall control his operations by tests to verify that CONTRACTOR has complied, and is complying at all times, with requirements of the Contract Documents regarding compaction, control, and testing.
- e. Frequency of CONTRACTOR's confirmation tests shall be not less than the following; each test location for trenches shall include tests for each layer, type, or class of backfill from bedding to finish grade.
 - 1) Trenches for Underground Facilities:
 - a) In open fields: Two locations every 1,000 linear feet.
 - b) Along dirt or gravel roads or off traveled rights-of-way: Two locations every 500 linear feet.
 - c) Crossing paved roads: Two locations along each crossing.
 - d) Under pavement cuts or within two feet of pavement edges one location every 400 linear feet.
- f. Promptly submit test reports to ENGINEER. Tests shall be performed by testing laboratory acceptable to ENGINEER.
- g. Demonstrate to ENGINEER adequacy of compaction equipment and procedures before exceeding one or more of the following quantities of earthwork:
 - 1) 200 linear feet of trench backfill.
- h. Until specified compaction of previously compacted earthwork is achieved, do not perform further earthwork of the same kind.
- i. Periodic compliance testing may be ordered by ENGINEER to verify that compaction is conforming to the Contract Documents; cost of such testing will be at no cost to CONTRACTOR. CONTRACTOR shall remove overburden above level at which ENGINEER desires to test, and backfill and re-compact excavation after testing is complete.
- j. If compaction does not conform to the Contract Documents, remove backfill and replace backfill at proper density, or bring density to specified level by other means acceptable to ENGINEER. Subsequent tests required to confirm and verify that reconstructed backfill has conforms to specified density shall be paid by CONTRACTOR. CONTRACTOR's confirmation tests shall be performed in manner acceptable to ENGINEER. Frequency of confirmation tests for remedial Work shall be double that amount specified for initial confirmation tests.

+ + END OF SECTION + +

SECTION 31 23 19

EXCAVATION DEWATERING

PART 1 – GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Furnish, permit, maintain and remove temporary surface water and groundwater control measures to prevent damage to adjacent structures and completed portions of the Work.
2. Collect and dispose of all discharge water from the dewatering and drainage systems in accordance with applicable regulations.
3. Treat contaminated groundwater, if encountered.

1.02 DEFINITIONS:

- A. MassDEP: Massachusetts Department of Environmental Protection.
- B. EPA: U.S. Environmental Protection Agency.
- C. MCP: Massachusetts Contingency Plan, 310 CMR 40.0000.
- D. BRP: Bureau of Resource Protection
- E. NPDES: National Pollutant Discharge Elimination System.
- F. "In-the-dry": An excavation subgrade where the groundwater level has been lowered to at least 2-ft below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.
- G. Dewatering General Permit (DGP): EPA NPDES permit which includes discharge requirements of uncontaminated water for construction dewatering to control groundwater intrusion and/or stormwater accumulation for sites less than one acre and establishes eligibility conditions, notice of intent requirements, effluent limitations, standards, prohibitions and best management practices. Comply with all DGP conditions. Prepare a dewatering plan and submit a completed Notice of Intent to EPA Region 1.

1.03 SUBMITTALS:

A. Submit the following in accordance with Section 01 33 00:

1. Within 14 days of the Notice to Proceed,
 - a. Evidence of license and registration of the Contractor's Professional Engineer
 - b. Groundwater and Storm Water Control Plan, designed and stamped by Contractor's Professional Engineer licensed by the Commonwealth of Massachusetts, to control groundwater and surface runoff during excavations, including the point(s) of effluent discharge that will be used, and shall include the following:
 - (i) Types and sizes of groundwater control systems to be used, including backup power and equipment to run the dewatering system without interruption.
 - (ii) Plans showing the locations and arrangements of recharge pits, discharge piping, frac tanks, and other groundwater control system components.
 - (iii) Provisions for limiting siltation, separating oil or fuel from discharge, and for meeting discharge requirements.
 - (iv) Calculations indicating that the dewatering system will control surface and groundwater.
 - (v) Procedures and drawings for abandoning the dewatering system left below grade and below structures.
 - c. Submit the appropriate DGP Notice of Intent to USEPA Region I.
2. Coordinate dewatering and drainage submittals with the excavation and support of excavation submittals. The submittal shall show the areas and depths of excavation to be dewatered.
3. Do not proceed with any excavation or dewatering activities until the dewatering submittals have been reviewed and approved.
4. Submit monitoring reports required by permits.

1.04 PROJECT/SITE CONDITIONS:

A. Existing Conditions:

1. Existing conditions are described in Section 01 11 13 and as shown on the Drawings.

1.05 QUALITY CONTROL

- A. A Licensed Professional Engineer registered in the Commonwealth of Massachusetts shall design the dewatering system and supervise its installation. If the dewatering system is a well point system, the Engineer shall be present during startup and shall visit the site weekly to monitor its operation.

PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.
- B. Provide sand and gravel filter around the well screen. Wrapping geotextile fabric directly around the well screen not allowed.
- C. When well points or vacuum well points are used, provide pumping units capable of maintaining high vacuum and handling large volumes of air and water at the same time.
- D. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.
- E. Provide and maintain erosion/sedimentation control devices in accordance with the dewatering plan and Section 01 57 05.
- F. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.
- G. Provide cement grout having a water cement ratio of 1 to 1 by volume.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Prior to commencing ground water dewatering activities:

1. Prepare and submit to the U.S. Environmental Protection Agency a Notice of Intent for a National Pollution Discharge Elimination System (NPDES) DGP.
- B. Control surface water and groundwater such that excavation to final grade is made in-the-dry. Construction and backfilling shall proceed in-the -dry and flotation of completed portions of the work shall be prohibited.
- C. Dewatering units used in the work shall be equipped with a filtering device so that no fine soil particles are removed from excavations by pumping.
- D. Pipe, masonry, and concrete shall not be placed in water or be submerged within 24 hours after being installed. Water shall not flow over new masonry or concrete within four days after placement.
- E. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of pipes, tanks and other structures by promptly placing backfill. If the subgrade of the trench or excavation becomes disturbed due to inadequate dewatering or drainage, excavate and backfill at no additional cost to the Town.
- F. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.
- G. Install, monitor and report data from observation wells. Do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 2-ft below the bottom of the final excavation within the excavation limits.

3.02 DISCHARGE OF DEWATERING WATER – GENERAL:

- A. Dewatering discharge, including surface runoff, shall:
 1. Be in accordance with the Groundwater and Storm Water Control Plan.
 2. Not damage adjacent properties, pavements and other surfaces, buildings, structures, utilities, and the environment.
 3. Not be discharged into sanitary sewers or combined sewers.
- B. Install sand and gravel filters in conjunction with well points and deep wells to prevent the migration of fines from the existing soil during the dewatering operation.
- C. Transport pumped or drained water to discharge location without interference to

other work, damage to pavement, other surfaces, or property. Groundwater shall be discharged in accordance with the permitting requirements specified in Section 01 31 46.

- D. Provide separate discharge pipe with valves for each dewatering pump.
- E. Immediately notify the Town if contaminated groundwater is encountered. Do not pump water found to be contaminated with oil or other hazardous materials to discharge locations allowed for uncontaminated water.

3.03 DISCHARGE OF UNCONTAMINATED AND CONTAMINATED DEWATERING WATER TO SURFACE WATER OR STORM DRAINS:

- A. Comply with all applicable regulations.
- B. Obtain and comply with all applicable permits.
- C. Sample and provide analyses of the dewatering system discharge to monitor permit compliance.
- D. Operate and maintain the system in compliance with regulations and permit requirements.

3.04 REMOVAL OF SYSTEMS

- A. At the completion of dewatering operations, remove all dewatering equipment and restore site to pre-construction conditions. Seal wells installed as part of the dewatering system with grout and cut off a minimum of 3-ft below finished ground level or 1-ft below foundation level.
- B. Leave in place any casings for deep wells, well points or observation wells located within the plan limits of structures and pipelines and within the zone below or where removal would otherwise result in ground movements causing settlement to adjacent ground surface, utilities or existing structures.

END OF SECTION

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SECTION 33 01 30.16

TELEVISION INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to perform television (TV) inspection of existing, new and rehabilitated piping including sewer mains and sewer lateral connections.

1.2 DEFINITIONS

- A. Pre-Construction Inspection: TV inspection of sewers and/or laterals to determine the location of construction, structural and O&M features and to ascertain that the condition of the pipe meets acceptable standards for the proposed rehabilitation.
- B. Post-Construction Inspection: TV inspection of repaired or rehabilitated sewer mains, lateral connections, and laterals to determine the location of construction, structural and O&M features and to verify that all repairs have been performed.
- C. Joint Testing Observations: TV recording of testing and retesting of sewer pipe joints and lateral connections.
- D. Warranty Inspection: TV inspection of sewer to be performed following a specified waiting period after completion of rehabilitation.

1.3 REQUIREMENTS:

- A. The CONTRACTOR shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces.

1.4 RELATED SECTIONS

- A. Section 01 35.26.23, Contractor Requirements for Confined Space Entry
- B. Section 01 51 41, Temporary Pumping.

1.5 PERFORMANCE REQUIREMENTS

- A. Inspection shall be performed by a National Association of Sewer Service Companies (NASSCO) *Pipeline Assessment Certification Program* (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by PACP, and severity ratings shall be calculated according to PACP.
- B. Quality of inspection recording shall be acceptable to ENGINEER when viewed on a standard computer monitor.

1.6 SUBMITTALS

- A. CCTV equipment, including make, model, age of video systems and tractors, and documentation that CCTV software is PACP v4.4 -certified. PACP-compliant software will not be accepted.
- B. Copies of PACP certificate for inspectors completing the work.
- C. Submit two (2) copies of digital video disks (DVDs) containing the videos of the television inspections and TV Inspection Reports to the ENGINEER for review on a weekly basis, by each Wednesday, for CCTV completed during the preceding week.
 - 1. Provide DVDs of a quality sufficient for the ENGINEER to evaluate the condition of the sewer, locate the sewer service connections, and verify cleaning. If quality is not sufficient, CONTRACTOR shall re-televise the sewer segment and provide a new DVD and report at no additional cost to the OWNER. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection of a DVD and rejection of the associated line segment.
 - 2. DVDs submitted become the property of the OWNER.
 - 3. CONTRACTOR shall maintain a master copy of all TV DVDs and TV Inspection Reports submitted, until final acceptance of contract, at which time all copies are to be turned over to the OWNER.
 - 4. The pre-and post-rehabilitation television inspection video DVDs shall not be edited.

1.7 REFERENCE STANDARDS

- A. NASSCO prepared *Pipeline Assessment and Certification Program*, Version 6.0.1 Reference Manual, November 2010. This manual includes a standard TV inspection form and sewer condition codes.

PART 2 - PRODUCTS

2.1 TELEVISION EQUIPMENT

- A. Closed Circuit TV Equipment: Select and use closed-circuit television equipment that will produce a color recording. The camera and video system components shall have the following properties:
 - 1. Equipped with footage counter accurate to two tenths of a foot that displays on the TV monitor the exact distance of the camera from the starting point of the recording.
 - 2. Lighting system that allows the features and condition of the pipe to be clearly seen. Lighting shall not cause shadows or loss of color within the field of view of the camera.

3. Capable of operating in 100 percent humidity conditions.
 4. Capable of producing a minimum 470 lines of vertical resolution color video picture. Picture quality and definition shall be to the satisfaction of the ENGINEER.
- B. Pipe Inspection Camera: The pipe inspection camera and video components shall have the following additional properties:
1. Capable of producing a video recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees.
 2. Camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised.
 3. Include a reflector in front of the camera if necessary to provide acceptable video image quality in large diameter pipe.
- C. TV Studio: TV studio is to be contained in an enclosed truck, trailer or van. It shall have room and seating for the operator and the ENGINEER and also room for at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor, and winches is to be from a control panel in the studio. When joint testing and sealing is to be performed, the equipment shall be contained in the same unit as its TV equipment and shall be operated from the same control panel.
- D. Recording: All recordings are to be in digital format.
1. Image Capture – Digitized picture images shall be stored and be exportable as JPEG formats.
 2. Video Capture - Full time live video and audio files shall be captured for each pipe segment and lateral inspected. The files shall be stored in industry standard Windows Media or MPEG-4 format on a USB 2.0 external hard drive and viewable on a personal computer that utilizes MicroSoft Media Player, version 9.0. Alternate digital formats will not be accepted unless approved by the ENGINEER in advance of submittal. The video shall have a minimum resolution of 640 pixels (x) by 480 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be “Burned” to digital format. It shall have the capability of “burning” a minimum of 120 minutes of recording to the DVDR media. The video recording shall be free of electrical interference and shall produce a clear and stable image. The audio recording shall be sufficiently free of background and electrical noise as to produce an oral report that is clear and discernable. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

PART 3 - EXECUTION

3.1 TELEVISUAL INSPECTION

- A. Prior to TV inspection, clean sewer lines, laterals and manholes in accordance with Section 33 01 30.41, Cleaning of Sewers. Re-clean any sewer line or manhole found to be insufficiently cleaned during the TV inspection process.
- B. Perform Post-construction Inspections of cured-in-place materials after the waiting period specified in applicable specification for the cured-in-place materials.
- C. Televis the sewer line to document the condition of the line. Notify the ENGINEER 48 hours in advance of any TV inspection so that the ENGINEER may observe inspection operations. Provide a color recording showing the completed work.
- D. Center camera in manhole invert to the extent allowed by the channel geometry. For inspections from manholes, pan and record the entire circumference of the pipe penetration/manhole wall.
- E. With camera rolling, perform the distance counter preset. If a preset point on the CCTV cable is used to set the counter, CONTRACTOR shall back up the camera after setting the preset and record the entry to the pipe.
- F. Mainline inspection shall be from center of the starting manhole to the center of the ending manhole. Measure distances along the pipe from the inside of manhole wall of the starting manhole to inside of manhole wall of the downstream manhole.
- G. Prior to recording the location of defects, construction features and service connections, remove slack in the cable of the television inspection camera to ensure metering device is designating proper footage. Check accuracy of the measurement meters daily by use of a walking meter, roll-a-tape, or other suitable device.
- H. Center the camera in the middle of the pipe.
- I. Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not to exceed 20 feet per minute.
- J. Stop at every joint for three seconds. When infiltration or other defects are evident, use pan and tilt to document pipe condition. Stop elsewhere when necessary to ensure proper documentation of the sewer's condition.
- K. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Pan the circumference of the tap, recording all defects found in the service connection. Where lateral flow is observed, observe flows from service connections for approximately two minutes to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on video recording and inspection logs.

- L. Capture color still shots of video recordings for all defects encountered.
- M. Use manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions to move the camera through the sewer line.
- N. TV inspection recordings shall be continuous for each pipe segment.
- O. Adjust light levels, clean fouled or fogged lens, and allow vapor to dissipate from camera lights in order to produce acceptable recordings. All TV inspection recordings that do not meet the specified requirements shall be retelevised at no additional cost to the OWNER.
- P. Provide audio comments on the DVDs regarding any and all observations, including location and condition of services, structural defects, estimated flow rate of infiltration, root intrusion, grease or debris build up, and other obstructions, blockages, or pertinent observations.

3.2 FLOW CONTROL

- A. Adequately control the flow in the section being televised. Plugging or bypassing, in accordance with Section 01 51 41, Temporary Pumping, of the flows may be used to accomplish this. Recordings made where the depths of wastewater flow shown below are exceeded will be rejected:

<u>Pipe Diameter (Inches)</u>	<u>Depth of Flow (% of Pipe Diameter)</u>
6-10	10
12-24	15
Over 24	20

- B. Whenever flows in a sewer line are blocked, plugged, pumped, or bypassed, take sufficient precautions to protect the sewer lines from damage that might be inflicted by excess sewer surcharging. Further, take precautions to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. The CONTRACTOR is responsible for all damages.
- C. CONTRACTOR is responsible for all damages to CONTRACTOR owned and operated equipment, OWNER facilities, and privately owned facilities caused by malfunction of plugs, pumps or other CONTRACTOR equipment. In the event of a failure or malfunction of CONTRACTOR equipment, CONTRACTOR is responsible for all work necessary to restore facilities to pre-construction condition including but not limited to excavation and restoration of sewer lines and roadways required to retrieve malfunctioning or stuck cameras, plugs and hoses.
- D. It is anticipated that portions of the sanitary sewer are bowed or bellied and as a result the camera will be submerged. Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with swab,

high-velocity jet nozzle or other acceptable dewatering device. Recordings made while floating the camera are not acceptable unless approved by ENGINEER.

3.3 PASSAGE OF TV CAMERA

- A. Do not pull or propel the television camera through the line at a speed greater than 20 feet per minute.
- B. If during TV inspection of a pipe segment the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite direction in order to obtain a complete recording of the line. Measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the manhole segment. If such a condition arises, notify the ENGINEER and OWNER to determine if an obstruction removal or point repair is necessary. If a point repair is authorized, repair the pipe at the designated location and then re-televise the manhole section to verify completion of the point repair, unless waived by the ENGINEER.
 - 1. When the camera is being pulled from the other direction in order to survey on either side of an obstruction and a second repair location is encountered away from the first obstruction, notify the ENGINEER and request a review of the DVD.
 - 2. If two point repairs are completed, re-televise the pipe section. Generally, up to 20 feet of the sewer pipe from the finished end of the first point repair to the starting end of the second point repair may be lamped or physically inspected to verify the condition of the sewer without further TV inspection.
 - 3. The ENGINEER makes no guarantee that the sewer specified or proposed for rehabilitation TV inspection after cleaning, is clear for the passage of the camera set-up. Select the appropriate equipment, tools, and methods for securing safe passage of the camera.
- C. During preliminary TV inspection, pipeline defects and infiltration/inflow sources shall be panned by the inspection camera. The CONTRACTOR shall provide estimates of the flow rate of infiltration/inflow. All defects and infiltration/inflow sources shall be pan and tilt inspected to determine the condition. Any infiltration/inflow sources will be observed for a minimum of two minutes to estimate the flow entering the sewer line. Results will be recorded in the written logs.
- D. During pre-rehabilitation TV inspection, camera passage should show the line is ready to rehabilitate. Report any variations between previous reported (existing data) conditions and the actual conditions encountered to the ENGINEER.
- E. For post-rehabilitation TV inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation work and the conformance of the work to the Specifications. Provide a full 360 degree view of pipe, joints and service connections.

3.4 INSPECTION DELIVERABLES

- A. Written Inspection Reports (2 copies)
 - 1. Provide printed location records to clearly identify the location of each defect, or lateral connection, in relation to adjacent manholes, using a standard stationing system zeroed on the upstream manhole. Record all information requested using proper NASSCO PACP defect codes. The reports shall include at least the minimum amount of information required by PACP, including required PACP header information. Color still shot images of all defects encountered shall be included with each pipe segment.
- B. Electronic Inspection Reports
 - 1. Provide a NASSCO PACP v4.2 certified database listing all PACP required data fields for each pipe segment on CD (2 copies).
- C. Inspection Recordings (2 copies of all DVDs)
 - 1. Provide digital inspection recordings for all recordings, unless otherwise specified in Paragraph 3.4.D.
 - 2. Recording shall be of a quality sufficient for ENGINEER to evaluate the condition of the sewer, locate the sewer service connections, and verify cleaning and joint testing. If ENGINEER determines that the quality is not sufficient, re-televising the sewer segment and provide a new recording and report at no additional compensation. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection. Payment for televised inspection will not be made until ENGINEER approves the recordings and reports.
 - 3. Digital recordings: Each pipe segment must be its own electronic file. Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.
 - 4. Each DVD must have a file index whose name contains the pipe segment reference number.
 - 5. Maintain a master copy of all recordings and Inspection Reports for two years after delivery of reports and recordings.
 - 6. Label each DVD with the following information:
 - a. File Number.
 - b. CONTRACTOR's Name.
 - c. Project Name, Location, Title.
 - d. Contract Number.
 - e. Drawing Number.
 - f. Inspection Type: Pre-Rehabilitation, Post-Rehabilitation, Warranty Re-Inspection.
 - g. Date Televised.

- h. Pipe Segment Asset Identification Number.
- i. Wastewater file number.
- j. DVD #.
- k. Date submitted.

D. Inspection deliverables for different types of inspections are defined below.

1. Physical Condition Inspection: One copy on a 400mbps USB 2.0 external hard drive of PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.
2. Pre-Construction Inspection: One copy on a 400mbps USB 2.0 external hard drive of PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.
3. Post-construction Inspection:
 - a. Two copies of Written Inspection Reports in bound report with project name on binder spine. Reports to be filed in ascending order by upper manhole number.
 - b. One copy on a 400mbps USB 2.0 external hard drive of the PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.
4. Warranty Inspection: Same as Post-construction Inspection.

+ + END OF SECTION + +

SECTION 33 01 30.41

CLEANING OF SEWERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to clean the pipelines, laterals and manholes.
- B. The cleaning Work required includes, but is not limited to, the following:
 - 1. Field locating all manholes along the sewer reaches to be cleaned.
 - 2. Cleaning existing sanitary sewers and laterals in preparation for rehabilitation.
 - 3. Cutting of roots, grease, intruding sealing ring material and objects wedged in pipe joints from existing sanitary sewers and laterals.
 - 4. Removal of debris from the sewers and laterals.
 - 5. Pressure washing of manhole walls, rungs, channel and bench.
 - 6. Disposal of waste and sediment.
 - 7. Cleaning up as the Work progresses and after the completion of all Work activities.
 - 8. All other Work required for the sufficient cleaning of the pipelines to complete rehabilitation per the design. .

1.2 DEFINITIONS

Not used.

1.3 RELATED SECTIONS

- A. Section 01 35 26.23, Contractor Requirements for Confined Space Entry
- B. Section 01 51 41, Temporary Pumping
- C. Section 33 01 30.41, Television Inspection of Sewers
- D. Section 33 01 30.73, Cured-in-Place Spot Repair

1.4 GENERAL PRECAUTIONS

- A. This Contract requires work in active sewers. Adhere to all federal, state and local requirements for safety in confined spaces.
- B. Take precautions to protect sewer mains, laterals and manholes from damage that might be inflicted by the improper selection of the cleaning process or improper use of the equipment.

- C. When using hydraulically propelled devices, take precautions to ensure that the water pressure created does not cause damage or flooding to public or private property.
- D. Do not surcharge the sewer beyond the elevation that could cause overflow of sewage into area waterways, homes, or buildings or onto the ground.
- E. Some of the manholes accessing sections of the sewer included in this work are on private property where either specific easements and/or trespass agreements with individual property owners have or have not been negotiated. All easements are typically shown on the Drawings, and copies of the pertinent trespass agreements are available for review by contacting the ENGINEER. Do not enter private property for which access agreements with the OWNER have not been executed. Limit operations to those specifically approved in said trespass agreements.
- F. Restore or repair any facility, public or private, which is damaged by CONTRACTOR actions at no cost to OWNER.
- G. The CONTRACTOR shall be aware that this Contract requires work in active sewer manholes and shall follow all federal, state, and local requirements for safety when in confined space. The CONTRACTOR shall be required to conform with all guidelines by the Occupational Safety and Health Administration Federal Regulations, 29 CFR Ch. XVII, Section 1910.146 Confined Space Entry.

1.5 SUBMITTALS

- A. Specifications of the sewer cleaning equipment, including performance data on pump, hose diameter and length, tank capacity, and intended nozzles and root cutters, to be used on the job. Provide a chart that shows hose length and diameter versus volume and pressure.
- B. Specifications on the equipment to be used to remove sediment and debris at the downstream manhole of each reach to be cleaned.
- C. Plan for disposal of debris and sediment removed from the sewer lines.
- D. Quantity of sediment removed (dry weight)
- E. Copy of manifest from disposal facility.

1.6 QUALIFICATIONS

- A. CONTRACTOR shall have experience in the cleaning of 50,000 LF of sewers. Documentation of experience shall be furnished to the ENGINEER upon request.

PART 2 - PRODUCTS

2.1 MAINLINE SEWER AND LATERAL CLEANING EQUIPMENT

- A. Sewer cleaning equipment shall consist of truck-mounted, high velocity hydro-cleaning equipment. The equipment shall be provided with a minimum of 500 feet of one-inch inner diameter high-pressure hose with a selection of high velocity nozzles, as required for the cleaning operation. The various nozzles shall produce a scouring action from 10 to 45 degrees in all size sewers to be cleaned. Use nozzles matched to the pumps and the site-specific cleaning requirements. Mount all nozzles with skids. A tiger tail or boot or downhole roller is required. A pressure gauge shall show operating pressure and a flow meter shall show flow rate. A table to translate shown pressures to delivery pressure shall accompany each cleaner unit.
- B. The pumps shall be capable of delivering a minimum 60 gpm at 2,000 psi at the nozzle head. A relief valve shall regulate pressure to the nozzle. The unit shall carry its own water tank, minimum of 1,000 gallons, auxiliary engines and pumps, and a hydraulically-driven hose reel.
- C. All controls shall be located so that the equipment can be operated above ground.
- D. Include appropriate adaptors, hoses and nozzles for cleaning laterals from mainline sewer. If utilizing an existing cleanout to clean lateral, provide equipment suitable for launching through cleanout to clean lateral.
- E. The CONTRACTOR shall certify that backup cleaning equipment, including machines, devices, tools, etc is available and can be delivered to the site within 24 hours.

2.2 MANHOLE CLEANING EQUIPMENT

- A. Provide a high velocity washing hose for cleaning of the walls, rungs, channel and bench of the manhole. The hose shall have an adjustable nozzle capable of producing flow from a fine spray to a solid stream. All controls shall be located so that the equipment can be operated above ground.
- B. The equipment shall meet the requirements of Section 33 01 30.81, Manhole Rehabilitation, when used for manhole preparation for rehabilitation work.

2.3 VACUUM EQUIPMENT

- A. Provide equipment capable of removing all sand, dirt, rocks, roots, and other debris from the sewer and manhole.
- B. Provide screens to prevent scoured debris from migrating downstream of the limits of the Work.

2.4 CUTTING EQUIPMENT

- A. Mainline Sewers: Provide equipment capable of mechanically removing roots, grease, and intruding seal material. Devices shall include a root saw, spring blade root cutter chuck, chaincutter, or approved equal.
- B. Laterals: For laterals with cleanouts, provide equipment that can mechanically cut roots and grease from lateral. For laterals without cleanouts, provide appropriate equipment that can be launched from the main to remove roots.

2.5 FLUSHING/CLEANING WATER

- A. Coordination for access to hydrants shall be made with the Town on a daily basis. Only hydrants approved by the Town will be allowed. The Contractor shall provide a tested and certified backflow preventer and meter for all water obtained from hydrants and be responsible for reporting water usage at the end of the project and at any point during the project as requested by the Town or Engineer.
- B. If cleaning water is obtained from another source, the Contractor shall provide proof that all flushing water was acquired lawfully.

PART 3 - EXECUTION

3.1 MAINLINE SEWER CLEANING

- A. Thoroughly clean all pipeline reaches in order to permit an unrestricted inspection by closed circuit television. Particular emphasis shall be afforded to the removal of accumulated grease, roots, sand, rocks, sludge and other debris so that the video inspection will show clearly all portions of the pipe being inspected. Pressure at the nozzle shall be between 1500 psi and 2000 psi and flow rate shall be between 60 gpm and 75 gpm during cleaning operations in the sewer, unless otherwise approved by the ENGINEER.
- B. Clean upstream reaches of sewers before the downstream reaches.
- C. Insert cleaning equipment into the downstream manhole of a given reach and pull the debris downstream. Reverse setups may be used if all debris is removed (i.e., no material is passed to the adjacent pipe segment).
- D. In mainlines, at a minimum, make one pass with a 30° - 45° nozzle at a rate not greater than 20 feet per minute, and one pass with a 10° - 15° nozzle at a rate not greater than 30 feet per minute.
- E. Rig winching equipment so as not to damage the existing pipeline or manholes.
- F. During cleaning, restrict the flow level in the pipe to a maximum of 30 percent of the pipe diameter. Take particular care to avoid flooding house connections during cleaning operations.
- G. Remove any blockages of lateral building connections resulting from the cleaning or other items of Work by cleaning of the building connection at no additional cost to the OWNER.

3.2 MANHOLE CLEANING

- A. Wash the wall, bench, channel and rungs of the manhole to remove accumulated debris, grease, sediment, and grit.

3.3 ROOT, GREASE AND INTRUDING SEAL MATERIAL REMOVAL

- A. Remove all roots that could prevent the sealing of a packer, the proper application of chemical sealants or installation of a cured-in-place liner. Remove roots by suitable mechanical cutting devices or by hydraulic procedures such as with high-pressure jet cleaners. No roots of length greater than one and a half inches (1½-inch) shall remain following root removal procedures.
- B. Remove all grease which could prevent the sealing of a packer, the proper application of chemical sealants, or the installation of a cured-in-place liner. Use suitable mechanical cutting devices to remove grease.
- C. Remove objects wedged in pipe joints and intruding sealing ring material that interferes with the rehabilitation of sewer lines.

- A. 3.4 LATERAL cleaning and Root Cutting Thoroughly clean the portion of the lateral to be inspected or rehabilitated with cured-in-place lining in order to permit an unrestricted inspection by closed circuit television. Particular emphasis shall be afforded to the removal of accumulated grease, roots, sand, rocks, sludge and other debris so that the video inspection will show clearly all portions of the pipe being inspected. Minor hair roots that will not interfere with lateral lining are not required to be removed from laterals.

3.5 DEBRIS REMOVAL

- A. Remove all bricks, rocks, debris, sludge, dirt, sand, grease, roots, and other materials from the sewer and manhole and collect and remove the resulting debris from the downstream manholes of the sewer sections being cleaned. Utilize control measures in downstream manholes as necessary to prevent debris, sludge and other materials from passing through manholes to a downstream sewer section not scheduled for cleaning by CONTRACTOR that same day.
- B. When removing materials from manholes, return the discharge and drainage liquid stream to the downstream sewer and discharge downstream for disposal. Under no circumstances shall sewage or solids be dumped onto the ground surface, street, stream, ditches, catch basins, or storm drains. All solids and semi-solids shall be placed in a watertight container so that no spillage or leakage will occur, covered to minimize odors, and disposed by the CONTRACTOR. The CONTRACTOR is responsible for all operations and costs associated with removal, transportation, and disposal of debris collected during the cleaning operations.

3.6 DISPOSAL

- A. The Contractor shall be responsible for offsite disposal of debris and other material removed as part of the cleaning process.
- B. Maintain and have available upon request a copy of the manifest from the disposal facility.

3.7 FIELD QUALITY CONTROL

- A. Acceptance of pipeline cleaning shall be made upon the successful completion of the television inspection documenting that all required debris, solids, sand, roots, grit and grease are removed to the satisfaction of the ENGINEER. If television inspection shows debris, solids, sand, roots, grease, or grit remaining in the line, re-clean and re-inspect the pipeline at no additional compensation to the OWNER.

++END OF SECTION++

SECTION 33 01 30.73

CURED-IN-PLACE SPOT REPAIR

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope: The CONTRACTOR shall furnish all materials, labor and equipment and perform all incidental work necessary to install and test cured-in-place spot repairs (CIPSR) as specified.
- B. Related Work Specified Elsewhere:
 - 1. Section 01 51 41, Temporary Pumping
 - 2. Section 33 01 30.16, Television Inspection of Sewers.
 - 3. Section 33 01 30.41, Cleaning of Sewers.
- C. Requirements: The CONTRACTOR shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces. The CONTRACTOR shall be required to conform to all guidelines set forth by the Occupational Safety and Health Administration (OSHA) Federal Regulations; 29 CR Ch. XVII, Section 1910.146 Confined Space Entry.

1.2 SUBMITTALS

- A. Submit to ENGINEER within 15 days of the Effective Date of the Agreement, the name of the CIPSR supplier and a list of all materials to be furnished.
- B. Provide two submittals of certified test reports to confirm that CIPSR materials are manufactured and tested in accordance with the ASTM Standards specified herein.
 - 1. Within 15 days of the Effective Date of the Agreement, submit test reports for the materials to be used for this work. Test results shall be the manufacturer's standards for acceptance of field fabricated and installed CIPSR.
 - 2. Prior to the installation of any CIPSR, make test specimens from the materials to be utilized for this work. Make sufficient number of specimens for conducting the referenced testing. Specimens shall be cut from the resin-impregnated patch prior to insertion into the pipe.

1.3 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D543 - Standard Test Method for Resistance of Plastics to Chemical Reagents.

2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
 3. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 4. ASTM D2412 - Standard Test Methods for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
 5. ASTM D2990 - Standard Test Methods for Tensile, Comprehensive, and Flexural Creep and Creep-Rupture of Plastics.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

- A. The CONTRACTOR to furnish and install CIPSRs shall be fully qualified, experienced and equipped to complete the work in a timely and satisfactory manner. Submit the following information to the ENGINEER for review and approval before CIPSR work is performed.
1. The number of years of experience in performing this type of specialized work.
 2. Name of the CIPSR manufacturer and supplier for this work and previous work performed. The CONTRACTOR shall be an approved installer as certified and/or licensed by the manufacturer to install the CIPSR patches.
 3. A list of all municipal installations performed over the past 5 years along with the contact name, telephone number, and brief description of work performed.
 4. The OWNER reserves the right to disapprove the use of the CIPSR CONTRACTOR based on the submitted qualifications.
- B. All CIPSRs, regardless of pipe size or length, shall be furnished, fabricated and installed by a single manufacturer.
- C. As directed by the ENGINEER, replace all CIPSRs that utilize materials or methods of installation other than that approved. Remove and replace the CIPSR section or replace the affected pipe with new pipe at no cost to the OWNER.
- D. Furnish a mill certificate from the company manufacturing the fabric attesting that the fabric meets the chemical, physical and manufacturing requirements specified. Fabric will be rejected if it is found to have defects, rips, holes, flaws, deterioration or other damage.

1.5 GUARANTEE

- A. All CIPSRs shall be fully guaranteed by the CONTRACTOR for a period of 5 years from the date of acceptance. During this period, all defects in the CIPSRs shall be repaired in a manner satisfactory to the ENGINEER or the affected pipe shall be

removed and replaced with new pipe at no cost to the OWNER.

PART 2 - PRODUCTS

2.1 FIBERGLASS REPAIR MATERIAL

- A. The CIPSR shall be a resin impregnated fiberglass repair material sleeve which is wrapped around an inflatable packer and positioned in the sewer to be rehabilitated and cured in place by circulating hot water, steam, or heat to cure the resin.
- B. The CIPSR sleeve shall be fabricated from a minimum of two layers of fiberglass.
- C. The fiberglass shall be woven roving having a minimum weight of 24 oz/yd and shall be made of "E" glass coated with a sizing compatible with the resin being used.
- D. Fiberglass must fit tightly within host pipe, such as an overlapped system that bonds to wet surfaces.
- E. The epoxy resin shall be brought on site in the resin manufacturer's original containers. Each container shall be clearly labeled as to contents and product data. The resin shall be stored, mixed and applied in accordance with the manufacturer's recommendations.
- F. The CIPSR shall provide a service life of 50 years and shall have, as a minimum, the initial and long-term properties listed below.

<u>MECHANICAL PROPERTY</u>	<u>INITIAL</u>	<u>LONG-TERM</u>
Flexural Strength	8,000 psi	_____
Flexural Modulus of Elasticity	500,000 psi	250,000 psi
Tensile Strength	5,000 psi	_____
<u>MECHANICAL PROPERTY</u>	<u>INITIAL</u>	<u>LONG-TERM</u>
Tensile Modulus of Elasticity	500,000 psi	250,000 psi

- G. When cured, the CIPSR shall form a continuous, tight-fitting, hard, impermeable liner, which is chemically resistant to any chemicals normally found in domestic sewage. The CIPSR shall have a suitable membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface.
- H. The fiberglass sleeve shall be fabricated to a size that will tightly fit the sewer being

rehabilitated after being installed and cured. The transition from the patch to the existing pipe must be smoothly tapered.

- I. Thickness of the cured liner shall be as recommended by the manufacturer, but shall not exceed 1/4-in when cured unless authorized in writing by the ENGINEER.
- J. Spot repairs shall have a minimum length of 4-ft. CIPSR lengths shall extend a minimum of 1-ft beyond the pipe defects at each end of the repaired section. Length of each required repair shall be verified in the field prior to installation.
- K. CIPSRs shall not begin or end at a service connection or pipe joint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Each pipe segment to have CIPSR installed shall be cleaned manhole to manhole as specified in Section 33 01 30.41, Cleaning of Sewers, to prevent debris from being pulled to repair point. Any obstruction (i.e., protruding service tap, concrete) in the sewer that may impede insertion and installation of liner shall be removed and disposed of as specified.
- B. TV inspect and video tape pipe section to be rehabilitated. Verify location of defect, exact length of repair liner to be installed and all active service connections. TV inspection and videotapes shall comply with Section 33 01 30.16, Television Inspection of Sewers.
- C. Notify property OWNER whose services will be disrupted during installation of the CIPSR. Property owners' service connections in the repair area shall be requested not to use their services to prevent disruption to the curing process. Individual property owners affected shall be given a minimum of 72 hours advance notice, stating date, time, duration of disruption of service and estimated completion time.
- D. CONTRACTOR is responsible for the maintenance of sewer flow as specified in Section 01 51 41, Temporary Pumping.
- E. The CIPSR material shall be measured, cut and impregnated with epoxy resin under factory controlled conditions or in the field to the measurements specified herein. The installation and curing of the CIPSRs shall be in complete accordance with the manufacturer's specifications and if requested by the ENGINEER or OWNER, a representative of the manufacturer shall be present during the first day of installation.
- F. The spot repair liner shall be cured for the time period and method (i.e., steam, hot

water, ambient air, electrical heat) in accordance to the manufacturer's recommendations.

- G. The inflatable element and hydrostatic pressure used during the installation process shall be sufficient to tightly hold the CIPSR to the existing pipe wall, producing dimples at all service connections and squeezing resin into any cracks in the pipe. This pressure shall be great enough to overcome or prevent infiltration from entering the existing pipeline during the curing process.
- H. Spot repairs designated to be installed starting at the manhole, shall have the liner extend inside the manhole creating a watertight seal around the pipe connection and the invert of the manhole. If additional material is required to properly seal the invert and pipe connection, the CONTRACTOR shall use the same resin used in the spot repair liner material.
- I. Service connections shall be remotely reinstated by use of a cutting device and closed circuit television camera, as specified in Section 33 31 71, Sanitary Sewer Service Reconnection
- J. Sewer service connections and laterals shall be chemically grouted and sealed after reinstatement as specified in Section 33 01 30.61 Packer Injection Grouting and Section 33 01 30.65 Pressure Testing of Sewer Pipe Joints and Tap Connections, if indicated to be sealed under the Scope of Work.

3.2 FIELD TESTING AND ACCEPTANCE

- A. Upon completion of the installation of the cured-in-place spot repair and reinstatement of sewer service laterals, television inspection and video tapes of the completed work shall be conducted as specified in Section 33 01 30.16, Television Inspection of Sewers. Pre-rehabilitation and post-rehabilitation inspections shall be recorded on the same digital video disk (DVD). Acceptance of work shall be based on ENGINEER's review of television inspection.
- B. Any defects found, dry spots, voids, pinholes, protrusions, separations, etc., shall be corrected to the satisfaction of the ENGINEER. CONTRACTOR shall install a second CIPSR over the original CIPSR to correct defects, if directed by the ENGINEER. If corrections are still unsatisfactory, the CONTRACTOR shall cut out the section of pipe containing the CIPSR and install PVC pipe. All corrections to CIPSR shall be at no cost to the OWNER.

3.3 WARRANTY INSPECTION

- A. Provide a CCTV inspection approximately 18 to 24 months after completion of CIPSR work for 100% of the total spot repairs installed. All CCTV inspection shall be completed in accordance with Section 33 01 30.16, Television Inspection of

Sewers, and shall be completed in the presence of the ENGINEER. Actual period for inspection shall be determined by the ENGINEER and will ideally be conducted during high groundwater conditions. CONTRACTOR will be provided with a 60 day notice prior to period of inspection. Conduct all inspections in the presence of the ENGINEER.

- B. All defects discovered during the television inspection shall be corrected by the CONTRACTOR at no additional compensation. After the defects are corrected, the sewer shall be inspected again, immediately after repairs are made and again within the warranty inspection time frame indicated above, at no additional compensation. All re-inspection and repairs of defective materials or workmanship shall be completed at no cost to the OWNER.

++ END OF SECTION ++

SECTION 33 05 05

BURIED PIPING INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish all labor, materials, equipment, and incidentals as shown, specified, and required to install all buried piping, fittings, and specials and connect new pipe to existing pipe.

1.2 RELATED SECTIONS

- A. Section 31 23 05, Backfill.
- B. Section 33 01 30.16, Television Inspection of Sewers.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 - 1. Pipe reconnection details for joints, sewer laterals, cleanouts, and collection sewers including adapters and couplings.
 - 2. Manufacturer's literature and full product and installation details of piping, fittings, cleanout caps, joints, sealants and connections to existing piping and appurtenances.
- B. Cleanout installation method and property restoration plan.
- C. Post-Construction Inspection of all new pipe and fittings demonstrating all connections are free of leakage in accordance with Section 33 01 30.16, Television Inspection of Sewers.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle all pipe, fittings, appurtenances and accessories carefully with approved handling devices. Do not drop, roll or skid piping.
- B. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling.
- C. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove from Site.

1.5 JOB CONDITIONS AND GENERAL REQUIREMENTS

- A. Drawings show the general arrangement and extent of Work to be performed, but the exact location and arrangement of all piping shall be determined as the Work progresses to conform in the best possible manner with its surroundings.
- B. Drawings do not show all offsets, fittings, accessories, and details which may be

required. Examine all of the Drawings and Specifications for conditions which may affect the installation of the work and arrange the work accordingly. Field adjustments shall be made as conditions dictate.

1.6 GUARANTEE

- A. Correct any deficiencies found during the guarantee period within 1 month. Deficiencies include trip hazards, sink holes, drainage and related issues.
- B. Guarantee shall cover all piping, couplings, fittings, frames, and covers.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Maintain a supply of pipe fittings, adapters, and short lengths on hand to expedite connection of new pipe to existing manholes, mains and laterals.

2.2 SANITARY SEWER COUPLINGS

- A. For connection between new pipe and existing collection sewer, trunk line, or service.
 - 1. Type: Flexible PVC coupling with stainless steel shear ring.
 - 2. Construction: Flexible adapter coupling consisting of a neoprene gasket and stainless steel shear ring, with ½-inch stainless steel band clamps. Shear ring shall be stainless steel with a minimum thickness of 0.012". Tightening bands shall be stainless steel with stainless steel nut and bolt tightening clamps. Couplings shall be specifically sized for the outside diameters of the pipes being coupled. For connecting two lateral pipes of differing diameter, provide eccentric couplings.
 - a. Coupling sizes up through 12" shall have a width of 6".
 - b. Coupling sizes 15" and larger shall have a width of 10".
 - 3. Manufacturer:
 - a. Fernco Inc.
 - b. Mission Rubber Company (except for eccentric couplings)
 - c. Or equal.

2.3 LATERAL CONNECTION: SADDLE TAP

- A. Provide a tee or wye PVC flexible saddle tap coupling with stainless steel bands. Provide a silicone or polyurethane sealant compatible with the exterior of the main or CIPPL and saddle tap to be used to provide a watertight seal around tap opening.
- B. Model and Manufacturer:

1. TST or TSW flexible saddle tap and TSPK-46 Pressure Kit by Fernco, Inc.
2. Mission T-Flex Sewer Saddle
3. Or equal.

2.4 LATERAL CONNECTION: INSERTA TEE

- A. Provide Inserta Tee sized specifically for the main and lateral diameter and material to be connected.
- B. Manufacturer:
 1. Inserta Fittings Company
 2. Or equal.

2.5 LATERAL CLEANOUT CAP

- A. Provide compression cap. Bolt and nut shall be stainless steel. Other components shall be corrosion resistant plastic or rubber. Locking mechanism (if provided) may be brass.
- B. Manufacturer:
 1. Geotech Environmental Equipment, Inc.
 2. Cherne Industries, Inc.
 3. Or equal.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Excavate trenches in accordance with Section 31 23 16.13, Trenching.
- B. Install piping as shown, specified, and as recommended by the manufacturer.
- C. If there is a conflict between manufacturer's recommendations and the Drawings or Specifications, request instructions from ENGINEER before proceeding.
- D. All trench excavations shall be reviewed by ENGINEER prior to laying pipe. Notify ENGINEER in advance of excavating, bedding, and pipe laying operations.
- E. Excavate trenches to the minimum width required to provide adequate working space. Do not undercut trench walls.
- F. All pipe, fittings, and accessories shall be free from defects in material and workmanship. Verify the compatibility of all pipe and fittings.
- G. Protect adjacent utilities.

3.2 LATERAL CLEANOUT

NOT USED

3.3 PUSH-ON JOINTS

- A. Bevel all field-cut pipe, remove all burrs, and mark the correct insert depth from the pipe end.
 - 1. Clean the pipe end and the bell thoroughly before making the joint. Insert the O-ring gasket, making certain it is properly oriented.

3.4 BEDDING PIPE

- A. Excavate trenches below the pipe bottom by an amount shown and specified. Remove all loose and unsuitable material from the trench bottom. Do not install pipe bedding until ENGINEER approves the trench bottom condition.
- B. Carefully and thoroughly compact all pipe bedding with hand held pneumatic compactors.
- C. Do not lay pipe until the ENGINEER approves the bedding condition. If a conflict exists obtain clarification from ENGINEER before proceeding.
- D. Bed pipe as specified in Sections 31 23 05, Backfill, and 31 23 16.13, Trenching, and as shown on Drawings.

3.5 LAYING PIPE REQUIREMENTS

- A. Make the excavation a sufficient distance below the grade line to allow for the placing of the sewer pipe and the supporting bedding if such bedding is shown. Should the trench be excavated to a depth greater than required, refill such excess excavation with the same fill material as specified for the overlying fill or bedding and compacted as required for such overlying fill or bedding.
- B. Install and operate a dewatering system capable of maintaining the ground water level below the excavated trench bottom. Do not lay pipe in water. Maintain dry trench conditions until jointing is complete and backfilling is initiated. Protect and keep the interior of the pipe clean and free of debris. Sewer pipelines shall never be used as drains for removing water that has infiltrated into the trenches.
- C. Excavate around joints in bedding and lay pipe so that the barrel bears uniformly on the trench bottom. Excavate bell holes to prevent point loading of the bells.
- D. Apply lubricant to the pipe, bell, spigot, or gasket, or any combination thereof, as recommended by the manufacturer.
- E. Notify ENGINEER in advance of backfilling operations.
- F. Slice the bedding in the haunches of the pipe with a flattened shovel or other suitable tool and hand-tamp to ensure that the pipe is properly bedded.

3.6 CONNECTING EXISTING SEWERS

- A. When making connections to existing sewers, replace the existing pipes to the first competent joint or use a flexible coupling on a cut piece of sound, existing pipe. Properly bed, haunch and compact this connection in accordance with the Drawings for the type and depth of pipe installed. Do not encase in concrete unless said connection occurs at a utility crossing.

3.7 LATERAL CONNECTIONS

- A. When a portion of the existing main is being replaced (e.g. an excavated point repair on the main), install wyes and tees for all sewer house connections. Demonstrate that all connections are watertight.
- B. When existing main is to remain intact and the main has not been lined with CIPPL, provide a watertight connection between the lateral and the main. This may be done using the alternate methods (Contractor's option) described below.

- 1. Inserta Tee:

- a. Core drill sewer main to provide a smooth circular opening.
 - b. Install Inserta Tee in accordance with manufacturer's recommendations.

- 2. Saddle Tap:

- a. Prepare exterior of main so that it is clean and dry prior to installation of saddle tap.
 - b. Core drill tap opening in main, if necessary.
 - c. Apply a 1/2-inch wide bead of sealant on exterior of main around the tap opening and install saddle tap in accordance with manufacturer's recommendations.
 - d. Prior to attaching lateral pipe to saddle tap, verify the invert of the saddle tap aligns with the tap opening in the main.

- 3. Factory Wye or Tee:

- a. Cut the sewer main to remove a width of pipe sufficient to install a new factory wye or tee fitting connected directly to the existing main using couplings. Assure that the sewer main cuts are smooth and perpendicular to the main.
 - b. Connect new wye or tee to the main and to the lateral piping. Bed the new tee or wye fitting such that the invert aligns with the invert of the main.
 - c. All connections shall be watertight.

- C. When existing main is to remain intact and the main has been lined with CIPPL, provide a watertight connection between the lateral and the CIPPL installed in the existing main. This may be done using the alternate methods (Contractor's option) described below.

- 1. Insert-a-Tee:

- a. Remove a section of host pipe on the main to expose a portion of the CIPPL around tap opening.
 - b. Trim or core drill CIPPL to provide a smooth circular opening.
 - c. Install Insert-a-Tee in accordance with manufacturer's recommendations.
2. Saddle Tap:
- a. Remove a section of host pipe on the main to expose a portion of the CIPPL. Remove any rough edges on the exterior of the CIPPL to provide a smooth surface for attaching the saddle tap.
 - b. Prepare exterior of CIPPL so that it is clean and dry prior to installation of saddle tap.
 - c. Apply a ½-inch wide bead of sealant on exterior of CIPPL around the reinstated tap opening and install saddle tap in accordance with manufacturer's recommendations.
 - d. Prior to attaching lateral pipe to saddle tap, verify the invert of the saddle tap aligns with the reinstated tap opening in the CIPPL.
3. Factory Wye or Tee:
- a. Remove a section of host pipe on the main to expose a portion of the CIPPL.
 - b. Cut the CIPPL to remove a width of CIPPL sufficient to install a new factory wye or tee fitting connected directly to the CIPPL using couplings. Assure that the CIPPL cuts are smooth and perpendicular to the main.
 - c. Connect new wye or tee to the CIPPL and to the lateral piping. Bed the new tee or wye fitting such that the invert aligns with the invert of the CIPPL.
 - d. All connections shall be watertight.
- D. For laterals with transition in diameter, provide eccentric shielded coupling and align the inverts of the pipes.

3.8 BACKFILLING

- A. Conform to the applicable requirements of Section 31 23 05, Backfill.

3.9 WORK AFFECTING EXISTING PIPING

- A. Location of Existing Piping:
- 1. Locations of existing piping should be considered approximate.
 - 2. Determine the true location of existing piping to which connections are to be made, and location of other facilities which could be disturbed during earthwork operations, or which may be affected by the Work in anyway.
- B. Do not take pipelines out of service unless approved by ENGINEER and OWNER.

3.10 CLEANOUT INSPECTION AND TESTING

- A. CONTRACTOR shall coordinate with ENGINEER in order that ENGINEER can visually inspect cleanout installations prior to and during backfilling operations. CONTRACTOR shall repair any defects identified by ENGINEER prior to backfilling.
- B. For all cleanouts installed using the Vac-a-Tee process, CONTRACTOR shall conduct an exfiltration test by filling the riser pipe with a 6 foot column of water. The test shall be performed no sooner than two hours following installation of the saddle of the pipe. The duration of the test shall be 5 minutes. The water level shall be measured from the top of the riser pipe. Zero leakage is allowed.
- C. Conduct post-installation video recordings in presence of ENGINEER no sooner than two weeks after cleanout riser installation. Provide electronic (mpeg) recording of inspection as requested by ENGINEER. Inspection shall include the entire riser from grade to invert and the lateral from the cleanout to the coupling (or existing lateral joint for Vac-a-Tee installations) upstream and downstream of the cleanout. There shall be a separate video file for each cleanout. All files shall be named by street name and house number (e.g. Wilson42, Wilson44, etc.). Submit all videos on a USB hard drive.

3.11 EXCAVATED POINT REPAIR POST-CONSTRUCTION INSPECTION

- A. Provide a Post-Construction Inspection of all new pipe and fittings demonstrating all connections are free of leakage. For mainline sewer excavated point repairs, perform Post-Construction Inspection of the excavated repair prior to installation of CIPPL.

3.12 RESTORATION

- A. Provide restoration to match pre-construction conditions as nearly as practical and as shown and specified.
- B. If CONTRACTOR disturbs concrete sidewalk, replace full sidewalk width to nearest cold joint.
- C. If CONTRACTOR disturbs asphalt driveway, saw cut driveway to make a rectangular area for patching. Install hot mix asphalt to match existing depth and seal coat entire driveway.
- D. If CONTRACTOR disturbs concrete curb or gutter, replace in kind to nearest cold joint.
- E. Provide final restoration of lawns within 7 days of cleanout frame and cover installation.

+ + END OF SECTION + +

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SECTION 33 05 13

MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all precast, cast-in-place and masonry manholes and structures.

B. General:

1. Manholes and structures shall conform in shape, size, dimensions, material, and other respects to the details shown or as directed by ENGINEER.
2. Concrete for cast-in-place manholes and structures and for inverts in precast and masonry manholes and structures shall be Class "A" and shall conform to the requirements specified under Section 03 00 05, Concrete.
3. All manholes and structures shall be precast construction, unless otherwise shown. All sanitary or process manholes and structures carrying untreated wastewater shall be PVC lines or coated with Saueriesen or Sewer Shield 100.

C. Related Sections:

1. Section 03 30 05, Concrete.
2. Section 31 20 00, Earth Moving.
3. Section 46 24 23, Channel Grinders

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. American Society for Testing and Materials, (ASTM).
 - a. ASTM C 32, Specification for Sewer and Manhole Brick (made from Clay or Shale).
 - b. ASTM C 139, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - c. ASTM C 140, Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - d. ASTM C 207, Specification for Hydrated Lime for Masonry Purposes.
 - e. ASTM C 478, Specification for Precast Reinforced Concrete Manhole Sections.
2. American Water Works Association, (AWWA).
 - a. AWWA C302, Reinforced Concrete Pressure Pipe, Non-cylinder Type, for Water and Other Liquids.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. Submit drawings showing design and construction details of all precast concrete and cast-in-place manholes and structures, including details of joints between the manhole bases and riser sections and stubs or openings for the connections.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE MANHOLES AND STRUCTURES

- A. Precast manholes and structures shall conform to the details shown. Provide cast-in-place concrete bases where shown.
- B. Except where otherwise specified precast manhole components shall consist of reinforced concrete pipe sections especially designed for manhole construction and manufactured in accordance with ASTM C 478, except as modified herein.
- C. Precast, reinforced concrete manhole bases, riser sections, flat slabs and other components shall be manufactured by wet cast methods only, using forms which will provide smooth surfaces free from irregularities, honeycombing or other imperfections.
- D. Joints between manhole components shall be the tongue and groove type employing a single, continuous rubber O-ring gasket and shall conform to AWWA C302. The circumferential and longitudinal steel reinforcement shall extend into the bell and spigot ends of the joint without breaking the continuity of the steel. Joints between the base sections, riser sections and top slabs of manholes 72-inches in diameter and less shall be rubber and concrete joints. Joints for manhole components greater than 72-inches in diameter shall be provided with steel bell and spigot rings.
- E. All precast manhole components shall be of approved design and of sufficient strength to withstand the loads imposed upon them. They shall be designed for a minimum earth cover loading of 130 pounds per cubic foot, an H-20 wheel loading, and an allowance of 30 percent in roadways and 15 percent in rights-of-way for impact. Manhole bases shall have two cages of reinforcing steel in their walls, each of the area equal to that required in the riser sections. Wall thickness shall not be less than 5-inches. Concrete top slabs shall not be less than 8-inches thick.
- F. Lifting holes, if used in manhole components, shall be tapered, and no more than two shall be cast in each section. Tapered, solid rubber plugs shall be furnished to seal the lifting holes. The lifting holes shall be made to be sealed by plugs driven from the outside face of the section only.

- G. The point of intersection (P.I.) of the sewer pipe centerlines shall be marked with 1/4-inch diameter steel pin firmly enclosed in the floor of each manhole base and protruding approximately 1-inch above the finished floor of the base.
- H. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.
- I. The barrel of the manhole shall be constructed of various lengths of riser pipe manufactured in increments of one foot to provide the correct height with the fewest joints. Openings in the barrel of the manholes for sewers or drop connections will not be permitted closer than one foot from the nearest joint. Special manhole base or riser sections shall be furnished as necessary to meet this requirement.
- J. A precast or cast-in-place slab or precast eccentric cone, as shown or approved, shall be provided at the top of the manhole barrel to receive the cast iron frame and cover.

PART 3 - EXECUTION

3.1 PRECAST MANHOLE SECTIONS

- A. Set sections vertical in true alignment. The base of the bell or groove end at joints between components shall be buttered with 1:2 cement-sand mortar to provide a uniform bearing between components. All joints shall be sealed with cement mortar inside and out and troweled smooth to the contour of the wall surface. Raised or rough joint finishes will not be accepted.
- B. Install sections, joints and gaskets in accordance with manufacturers recommendations.
- C. Lifting holes shall be sealed tight with a solid rubber plug driven into the hole from the outside of the barrel and the remaining void filled with 1 to 2 cement-sand mortar.

3.2 MANHOLE CHANNELS

- A. All invert channels through manholes and structures shall be constructed of Class "A" concrete. Channels shall be properly formed to the sizes, cross sections, grades and shapes shown on the Contract Drawings. Benches shall be built up to the heights shown or as directed by the ENGINEER and given a uniform wood float finish. Care shall be taken to slope all benches for proper drainage to the invert channel.

3.3 GRADING RINGS

- A. Grading rings or brick stacks shall be used for all precast and masonry manholes and structures, where required. Stacks or grade rings shall be a maximum of 12-inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the stack or grade rings shall be such as required to bring the manhole frame to the proper grade.

- B. Each grade ring shall be laid in a full bed of mortar and shall be thoroughly bonded.
- C. Brick work shall be as specified in Article 2.2 and Article 3.1, above.

3.4 GRADING AT MANHOLES AND STRUCTURES

- A. All manholes and structures in unpaved areas shall be built, as shown or directed by the ENGINEER, to an elevation higher than the original ground. The ground surface shall be graded to drain away from the manhole. Fill shall be placed around manholes to the level of the upper rim of the manhole frame, and the surface evenly graded on a 1 to 5 slope to the existing surrounding ground, unless otherwise shown or directed by the ENGINEER. The slope shall be covered with 4-inches of topsoil, seeded and maintained until a satisfactory growth of grass is obtained.
- B. Manholes and structures in paved areas shall be constructed to meet the final surface grade. In paved areas on State Highways, all manholes and structures shall be 1/2-inch below final wearing surfaces. Manholes and structures shall not project above finished roadway pavements to prevent damage from snowplows.
- C. CONTRACTOR shall be solely responsible for the proper height of all manholes and structures necessary to reach the final grade at all locations. CONTRACTOR is cautioned that ENGINEER'S review of Shop Drawings for manhole components will be general in nature and CONTRACTOR shall provide an adequate supply of random length precast manhole riser sections to adjust any manhole to meet field conditions for final grading.

+ + END OF SECTION + +

SECTION 46 24 23

CHANNEL GRINDERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install inline grinding equipment complete and operational.
2. Included are grinder, drive unit assembly, control panel, power and signal cables, anchorage systems and all appurtenances.
3. Extent of the equipment is shown on the Schedule of Service Conditions contained in Part 2 of this specification.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the inline grinders Work.

C. Related Sections:

1. Section 03 00 05, Concrete.
2. Section 05 05 33, Anchor Systems.
3. Section 09 91 00, Painting.
4. Section 26 05 05, Electrical Work

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. Underwriters Laboratory (UL and eUL)
2. International Electrotechnical Commission (IEC)
3. American Bearing Manufacturers Association, (ABMA).
4. American Gear Manufacturers Association, (AGMA).
5. American Institute of Steel Construction, (AISI).
6. American National Standards Institute, (ANSI).
 - a. ANSI B16.1, Cast-Iron Pipe Flange and Flange Fittings.
 - b. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2 Thru 48-Inches.
7. American Society of Testing Materials, (ASTM).
 - a. ASTM A 536, Specification for Ductile Iron Castings.
8. National Electrical Code, (NEC).
9. National Electrical Manufacturers Association, (NEMA).
10. Institute of Electrical and Electronic Engineers, (IEEE).
11. American Society for Testing and Materials (ASTM) A36: Carbon Steel Plate

12. American Society for Testing and Materials (ASTM) A536-84: Ferritic Ductile Iron Castings
13. American Society for Testing and Materials (ASTM) A48-83: Grey Iron Casting
14. American Society for Testing and Materials (ASTM) A743 Casting
15. American Iron and Steel Institute (AISI) 303 Stainless Steel
16. American Iron and Steel Institute (AISI) 304 Stainless Steel
17. American Iron and Steel Institute (AISI) 316 Stainless Steel
18. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel
19. American Iron and Steel Institute (AISI) 4140 Heat Treated Alloy Steel
20. American Iron and Steel Institute (AISI) 8620 Heat Treated Alloy Steel
21. American Iron and Steel Institute (AISI) 17-4 Stainless Steel
22. Society of Automotive Engineers (SAE) 660 Bearing Bronze

1.3 QUALITY ASSURANCE

A. Component Supply and Compatibility:

1. Obtain all equipment included in this Section, regardless of the component manufacturer, from a single inline grinder manufacturer.
2. The inline grinder equipment manufacturer to review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the inline grinder equipment manufacturer.
4. Equipment shall be identified with a corrosion resistant nameplate affixed in a conspicuous location.
5. Nameplate information shall include manufacturer's name and address, equipment model number, and serial number.
6. Special Warranty on Inline Grinders:
 1. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, at OWNER's option, remove, or replace materials or equipment specified in this Section and found to be defective for a period of three (3) years after date unit is put into full time service, including all materials and labor. Replacement value of items regularly subject to wear in normal use, such as seals, bearings, impellers, rotors, and stator, may be prorated.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Product Data:
 - a. Manufacturer's literature, data sheets, fabrication, assembly and mounting drawings of the following components showing materials and significant dimensions in sufficient detail to demonstrate compliance with specified requirements.
 1. Housing:
 - a) Materials of construction.
 2. Shafts and Cutting Elements:
 - a) Diameter.
 - b) Materials of construction.
 - c) Seals.
 3. Gear Reducers:
 - a) Materials of construction.
 - b) Bearing ratings.
 - c) Bearing life under maximum loading conditions.
 4. Motors:
 - a) Horsepower.
 - b) Rpm.
 - c) Insulation and enclosure details.
 - d) Efficiency at full, 3/4 and 1/2 load.
 5. Electrical Information:
 - a) Wiring diagrams showing all electrical connections to the motor and controls.
 - b) Drawings of control panels.
 6. Weight of the complete assembly.

B. Informational Submittals: Submit the following:

1. Source Quality Control Submittals:
 - a. Submit results of required control panel shop tests.
2. Site Quality Control Submittals:
 - a. Submit a written report giving the results of the required field tests.
 - b. Submit written report of the results of each visit by a manufacturer's serviceman, including purpose and time of visit, tasks performed and results obtained.
3. Support Design Information:
 - a. Weight of the complete assembly.

C. Closeout Submittals:

1. Operation and Maintenance Manuals:
 - a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
 - b. Furnish Operation and Maintenance Manuals in conformance with the

General Conditions.

D. Maintenance Material Submittals: Furnish the following:

1. Spare Parts:
 - a. Furnish all required spare parts as specified in Part 2 of this specification.
2. Tools:
 - a. Furnish all required special tools as specified in Part 2 of this specification.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
2. Delivery of the grinder to the site shall be FOB.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Description:

1. General: Furnish equipment suitable for the process and service conditions described below and in the Schedule of Service Conditions.
2. All grinders will normally operate with a flooded suction. When operated manually, all grinders could be subject to a less than full pipeline.

- B. Schedule of Service Conditions:
1. Location: New Sanitary Sewer Manhole
 2. Number of Units: 1
 3. Cutting Chamber Height, (in.): 32"
 4. Discharge Size, (in.): 15"
 5. Influent Pipe Size, (in.): 15"
 6. Liquid Pumped: Raw Sewage
 7. Suction Conditions: N/A
 8. Motor, (Hp): 5 Hp
 9. Capacity, (gpm): 1400 (min)
 10. Operating Pressure, (psig): N/A

2.2 MANUFACTURERS

- A. Products and Manufacturers: Provide one of the following:
1. JWC Environmental, Muffin Monster Model 3000
 2. Or equal.
- B. Manufacturers requesting to be selected as an approved equal shall submit certified documentation including installation lists with phone numbers, equipment drawings, flow performance curves, electrical schematics and cut sheets, O&M draft showing compliance with these specifications a minimum of ten (10) days prior to bid opening. Selected equipment manufacturers shall be added to the list of approved manufacturers.
- C. Selected approved equal manufacturers shall conduct an onsite test within ten (10) days of installation demonstrating compliance with all areas of this specification.

2.3 DETAILS OF GRINDER CONSTRUCTION

- A. Grinder shall reduce or shred influent solids for protection of downstream equipment. Grinder shall be two shafted design consisting of individual cutters and spacers, with cutters on drive and driven shafts of equal diameter. Grinder shall have individual motors and speed reducers for cutter drive shaft.
- B. Components
1. Cutters and Spacers
 - a. Cutting stack shall be a nominal height of 32-inches
 - b. Cutter shall be an individual disk constructed of AISI 8620 alloy steel surface ground to thickness of .438-inches $+.000/- .001$ (11.1 mm $+.000/- .003$).
 - c. Cutters shall be heat treated to produce a hardness of 60-65 Rockwell

- d. Cutters shall have 17 cam shaped teeth. Tooth height shall not be greater than ½-inch (13 mm) above the root diameter of the cutter. OD shall be 4.71-inches (120 mm).
 - e. Spacers shall be an individual disk constructed of AISI 8620 alloy steel surface ground to a thickness of .446-inches $\pm .001/- .000$ (11.3 mm $\pm .003/- .000$).
 - f. Spacers shall have a hardness of 34-38 Rockwell C.
 - g. Spacers shall have a smooth outside diameter with no tooth profiles.
- 2. Shafts
 - a. Shafts shall be constructed from AISI 4140 alloy steel with a minimum tensile strength of 170,000 PSI (1,172 kPA).
 - b. Shafts shall be measure a nominal 2-inches (51 mm) across flats of hex.
 - c. Shafts shall be hardened to 38-42 Rockwell C.
- 3. Seal Cartridges
 - a. Seal cartridges shall be rated to a maximum of 90 PSI (620 kPA).
 - b. Seal cartridges shall not require flushing.
 - c. Dynamic and rotating seal faces shall be constructed of tungsten carbide with 6% nickel binder.
 - d. O-rings shall be constructed of Buna-N (Nitrile).
 - e. Radial and axial loads shall be borne by sealed, oversized, deep-groove ball bearings.
- 4. Housings and Covers
 - a. End housings and top cover shall be constructed of ASTM A536-84 ductile iron.
 - b. End housings shall have integral bushing deflector to guide solids from seal cartridges.
 - c. Bottom cover shall be constructed of ASTM A-36 rolled steel.
- 5. Side Rails
 - a. Side rails shall be constructed of ASTM A536-84 ductile iron.
 - b. Cutter side rail shall have evenly-spaced horizontal slots to increase flow and decrease water head loss through the grinder. Slots shall only be located on the upstream or influent side of the rail and the effluent side of the rail shall be void of slots to allow for unobstructed flow.
 - c. Inside profile of the cutter side rail shall be concave and follow the radial arc of the cutters.
 - d. Clearance between the outside diameter of cutters and concave arc of the cutter side rail shall not exceed 5/16-inch (7.9 mm).
 - e. Side rails shall have integral guide slot for installing into framework.
- 6. Speed Reducer-Cutters
 - a. Reducer shall be manufactured by Sumitomo Machinery Corporation of America.
 - b. Reducer shall be internal planetary mechanism with trochoidal curved tooth profile.
 - c. Reducer shall be a vertically mounted with 29:1 single reduction.
 - d. Reducer shall be grease lubricated.

7. Motor-Cutters
 - a. Motor shall be 5 hp (3.7 kW), XLP, 1770 rpm, 460 volt, 3 phase, 60 Hz
 - b. Motor shall be U.L. rated NEMA 6P, Class I, Div. I Groups C&D, Class II, Div. II, Groups F&G, Class III Div. I
 - c. Motor shall additional rating of 7 consecutive days of submergence at a maximum depth of 30 feet (9 m).
 - d. Motor shall not utilize fan cooling at any time during operation.
 - e. Motor shall utilize ceramic shaft seal requiring no lubrication.
 - f. Motor shall have a minimum service factor of 1.15, 91% minimum efficiency factor at full load, minimum 76% power factor at full load.

C. Performance

1. Grinder shall be capable of processing 1400 gpm.
2. Grinder shall provide a minimum peak shaft torque of 3,981 lb-in/hp (603 Nm/kW).
3. Grinder shall provide a minimum peak force at cutter tip of 1717 lb_f/hp (10,240 N/ kW).

D. Frame and Supports

1. General: Frame and/or supports shall provide a method for properly securing the grinder in an open channel or wet well. The frame shall allow installation or removal without any disassembly of the frame or grinder.
2. Components
 - a. Frame and/or supports shall be constructed of AISI 304 stainless steel.
 - b. Frame shall be properly sized for the selected grinder and channel dimensions and provide proper support and interface to prevent unwanted bypass.
 - c. Frame shall utilize guides that insert into the grinders side rail slots to properly position and locate the grinder.

2.4 CONTROLLER

- A. General: Controller shall provide control of the grinder and be designed to control one (1) 5 hp (3.7 kW) and one (1) 1 hp (3/4 kW) at 120 volts, 3 phase, 60 Hz. The controller shall have an operator interface, indicator lights, switches and other control devices.

B. Components

1. Enclosures
 - a. Enclosure shall be 304 stainless steel NEMA 4X.
 - b. Enclosure shall house the control devices, motor starters, and PLC.
2. Grinder ON-OFF two-position 22mm type, NEMA 4X selector switch
 - a. In the OFF position, the grinder shall not run.

- b. In the ON position, the grinder shall run continuously.
- 3. Pilot Lights
 - a. Lights shall be LED type 22 mm, rated NEMA 4X.
 - b. Lights shall indicate GRINDER RUN and FAIL.
- 4. Programmable Logic Controller (PLC)
 - a. PLC shall have a minimum of 16K of memory.
- 5. Motor Starters
 - a. Starters shall be a full-voltage reversing type with 120 volt operating coils.
 - b. Overload relays shall be adjustable and sized to full load amperes (FLA) of the motor.
- 6. Main Circuit Breaker Disconnect and Motor Branch Circuit Protection Circuit Breakers
 - a. Circuit breakers shall be molded case type 3-pole, 208 volt.
 - b. Circuit breakers shall be sized to applicable NEC and UL standards.
- 7. Control Transformer
 - a. Control transformer shall be minimum 250VA.
 - b. Control transformer primary and secondary shall be fused for over current protection.
- 8. Current Transducers
 - a. Current transducer shall be manufactured by Veris Industries.
 - b. Current transducer shall have adjustable set point from 1-135A with 200ms or less response time.
- 9. Control Relays
 - a. Control Relays shall be manufactured by Idec Corp.
 - b. Control relays shall be rated for 10A (resistive load), DPDT, 120V with indicator light.
- C. Performance
 - 1. When a grinder jam condition occurs, the controller shall stop the grinder and reverse the grinder rotation to clear the obstruction. If the jam is cleared, the controller shall return the grinder to normal operation. If three (3) reverses occur within a 30 second interval, the controller shall stop the grinder motor and activate the grinder FAIL indicator and relay.
 - 2. When a power failure occurs while the grinder is operating, the grinder will resume operation once power is restored.
 - 3. When a power failure occurs while the grinder is in a fail condition, once power is restored the fail indicator shall reactivate and remain until reset.
 - 4. Reset of the grinder shall be accomplished from the controller only.

2.5 ANCHOR BOLTS

- A. Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Provide hooked anchor bolts for direct embedment during placement of concrete. Anchor bolt materials shall be of 304 stainless steel conforming to the requirements of Section 05 05 33, Anchor Systems.

2.6 TOOLS AND SPARE PARTS

- A. Furnish and deliver the following for each size boxed and labeled:
 - 1. 100 percent replacement seals for one machine.
 - 2. 100 percent replacement cutters for one machine.
 - 3. 100 percent replacement gaskets for one machine.
 - 4. Two sets of any special tools required for normal operation and maintenance.
- B. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the Project.
- C. Manufacturer shall furnish a list of additional recommended spare parts for an operating period of one year. The list shall describe each part, the quantity recommended, and the unit price of the part.

2.7 SURFACE PREPARATION AND PAINTING

- A. Grinders, motors, frames, appurtenances, etc., shall receive shop primer conforming to the requirements of Section 09 91 00, Painting.
- B. Surface preparation and painting shall conform to the requirements of Section 09 91 00, Painting.
- C. All gears, bearing surfaces, machined surfaces and other surfaces which are to remain unpainted shall receive a heavy application of grease or other rust-resistant coating. This coating shall be maintained during storage and until the equipment is placed into operation.
- D. CONTRACTOR shall certify, in writing, that the shop primer and finish coating system conforms to the requirements of Section 09 91 00, Painting.

2.8 LUBRICANTS

- A. Furnish lubricants and oil and grease as required for initial operation. Products shall be as recommended by the manufacturer.

2.9 SOURCE QUALITY CONTROL

- A. Visual Inspection: Verify that equipment complies with these Specifications and approved Shop Drawings.
- B. Packing:
 - 1. Inspect prior to packing to assure that assemblies and components are complete and undamaged.
 - 2. Protect machined surfaces and mating connections.
 - 3. Protect bearings and gearing with a shop applied corrosion prevention coating.

4. Cover all openings into gear boxes with vapor inhibiting and water repellent material.
5. Adequately crate to prevent damage during shipment, delivery and storage.
6. Identify crate contents on packing slip fastened to outside of crate.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall verify that structures, pipes and equipment are compatible.
- B. Make adjustment required to place system in proper operating condition.

3.2 INSTALLATION

- A. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the OWNER'S satisfaction.

3.3 FIELD QUALITY CONTROL

- A. All equipment will be given running tests by CONTRACTOR at the Site following installation of the equipment and controls. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately and is ready for permanent operation.
- B. Supplier shall provide services of a factory trained representative to check installation and review start-up of equipment and controls.
- C. Supplier Representative shall inspect and approve site installation and supervise a review of the operation of the equipment.
- D. Supplier Representative shall provide training on operation and maintenance requirements of the equipment.
- E. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of 2 visits, minimum 4 hours on-Site for each visit, to the Site. The first visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of the ENGINEER and verify that the equipment conforms to the

requirements. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.

- F. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the OWNER.

+ + END OF SECTION + +

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