



FAR REACH ROAD PUMP STATION UPGRADES WESTWOOD, MASSACHUSETTS DPW-21-B-004

Westwood Public Works
50 Carby Street
Westwood, Massachusetts 02090

May 2020
For Construction



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TABLE OF CONTENTS

INVITATION FOR BIDS

<u>Section</u>	<u>Title</u>	<u>Page</u>
I	General Information and Proposal Submission Requirements	Page - 1
II	Purchase Description/Scope of Supplies/Services	Page - 3
III	Pricing and Payment	Page - 5
IV	Quality Requirements	Page - 5
V	Rule of Award	Page - 6
VI	Equal Employment Opportunity, Antidiscrimination and Affirmative Action Goals	Page - 6
Att. A	Wage Rates	-
Att. B	Bid Form	-
Att. C	Labor Harmony and OSHA Training	-
Att. D	Certificate of Non-Collusion	-
Att. E	Tax Compliance Certification	-
Att. F	Signature Page	-
Att. G	Reference Form	-
00520	Agreement	00520-1
00510	Notice of Award (C-510)	00510-1
00550	Notice to Proceed (C-550)	00550-1
00610	Performance Bond (C-615-2013)	00610-1
00615	Payment Bond (C-615-2013)	00615-1
00700	General Conditions	00700-1
00800	Supplementary Conditions	00800-1

DIVISION 1 - GENERAL REQUIREMENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
01010	Summary of Work	01010-1
01024	Measurement and Payment	01024-1
01040	Project Coordination	01040-1
01046	Control of Work	01046-1
01063	Miscellaneous Requirements	01063-1
01095	Reference Standards and Definitions	01095-1
01110	Environmental Protection Measures	01110-1
01170	Special Provisions	01170-1
01200	Project Meetings	01200-1
01300	Submittals	01300-1
01311	Construction Progress Schedules	01311-1
01350	Health and Safety Plan	01350-1
01370	Schedule of Values	01370-1
01400	Quality Assurance	01400-1

DIVISION 1 - GENERAL REQUIREMENTS (CONT.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
01500	Temporary Facilities and Controls	01500-1
01610	Delivery, Storage and Handling	01610-1
01700	Contract Closeout	01700-1
01710	Cleaning Up	01710-1
01740	Warranties and Bonds	01740-1

DIVISION 2 - SITE WORK

<u>Section</u>	<u>Title</u>	<u>Page</u>
02020	Erosion and Sediment Control	02020-1
02101	Site Investigations	02101-1
02140	Dewatering and Drainage	02140-1
02160	Temporary Excavation Support Systems	02160-1
02200	Earthwork	02200-1
02212	Rock Excavation	02212-1
02570	Sewers, Manholes and Appurtenances	02570-1
02576	Pavement, Sidewalk and Curbing	02576-1
02538	Temporary By-Pass Pumping	02538-1
02901	Miscellaneous Work and Cleanup	02901-1
02920	Topsoil	02920-1
02945	Turf	02945-1

DIVISION 3 - CONCRETE

<u>Section</u>	<u>Title</u>	<u>Page</u>
03300	Cast-in-Place-Concrete	03300-1
03416	Precast Concrete Systems	03416-1
03500	Water Reactive Elastomeric Chemical Grout Injection	03500-1
03700	Modifications to Existing Concrete	03700-1

DIVISION 9 - PAINTING

<u>Section</u>	<u>Title</u>	<u>Page</u>
09900	Painting and Coating	09900-1
09901	Shop Primers	09901-1

DIVISION 11 - EQUIPMENT

<u>Section</u>	<u>Title</u>	<u>Page</u>
11200	Interior Process Piping and Valves	11200-1
11305	Flooded Suction Pumps	11305-1
11310	Access Hatch Grating	11310-1
11501	Process Gauges	11501-1

DIVISION 16 - ELECTRICAL

<u>Section</u>	<u>Title</u>	<u>Page</u>
16000	Electrical Work	16000-1

LIST OF APPENDICES

APPENDIX A

Sections of Massachusetts General Laws

APPENDIX B

Fuel and Cement Price Adjustments

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DIVISION 0

BIDDING AND CONTRACT REQUIREMENTS

INDEX

<u>Section</u>	<u>Title</u>	<u>Page</u>
I	General Information and Proposal Submission Requirements	Page - 1
II	Purchase Description/Scope of Supplies/Services	Page - 3
III	Pricing and Payment	Page - 5
IV	Quality Requirements	Page - 5
V	Rule of Award	Page - 6
VI	Equal Employment Opportunity, Antidiscrimination and Affirmative Action Goals	Page - 6
Att. A	Wage Rates	-
Att. B	Bid Form	-
Att. C	Labor Harmony and OSHA Training	-
Att. D	Certificate of Non-Collusion	-
Att. E	Tax Compliance Certification	-
Att. F	Signature Page	-
Att. G	Reference Form	-
00520	Agreement	00520-1
00510	Notice of Award (C-510)	00510-1
00550	Notice to Proceed (C-550)	00550-1
00610	Performance Bond (C-615-2013)	00610-1
00615	Payment Bond (C-615-2013)	00615-1
00700	General Conditions	00700-1
00800	Supplementary Conditions	00800-1

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Notice of Award

Date: _____

Project: FAR REACH ROAD PUMP STATION UPGRADE

Owner: Town of Westwood, MA

Owner's Contract No.:

Contract:

Engineer's Project No.: 309-1902

Bidder:

Bidder's Address:

You are notified that your Bid dated _____ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for the Far Reach Road Pump Station Upgrade project.

The Contract Price of your Contract is _____,
Dollars and _____ Cents (\$_____).

_ copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

_ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 10 days of the date you receive this Notice of Award.

1. Deliver to the Engineer fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security (Bonds) as specified in the Instructions to Bidders, General Conditions, and Supplementary Conditions.
3. It is acknowledged that ___ of your bid prices are abnormally low. It is understood that this will be waived as an informality as to form in your Bid. However you are hereby notified that the unrealistically low unit prices not reflecting the actual cost of the work bars you from any equitable adjustment of unit price bid items.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

Owner
By: _____
Authorized Signature

Title

Copy to Engineer

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TOWN OF WESTWOOD

ARTICLE 1 CONTRACT & GENERAL CONDITIONS

(Contract Number)

Date:

This Contract is entered into on, or as of, this date by and between the Town of Westwood (the "Town"), and

("Contractor")

(Mailing Address of the Contractor)

(Telephone)

(Fax)

(Website)

1. This is a Contract for the procurement of the following:

Far Reach Road Pump Station Upgrade

2. The Contract price to be paid to the Contractor by the **Town of Westwood** is:

AGREEMENT

SECTION 00520

FAR REACH ROAD PUMP STATION UPGRADE

WESTWOOD, MASSACHUSETTS

This Agreement is by and between the Town of Westwood, as requested by its Sewer Commission hereinafter called Owner and _____ hereinafter called Contractor.

Owner and Contractor hereby agree as follows:

ARTICLE 1. WORK

1.1 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described with the following title: "Far Reach Road Pump Station Upgrade, Contract No. DPW-21-B-004"

ARTICLE 2. ENGINEER

- 2.1 The part of the Project that pertains to the Work has been designed by Environmental Partners Group, Inc.
- 2.2 The Owner has retained Environmental Partners Group, Inc. ("Engineer") to act as Owner's representative, assuming all duties and responsibilities, rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIMES

3.1 Time of completion is set at **90 calendar days** including the date of notice to proceed, to substantially complete all work.

3.2 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 3.1 above and that Owner will suffer financial and other losses if the Work is not completed within the times specified in Paragraph 3.2 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner \$1,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 3.1 above for Substantial Completion

until the Work is substantially complete.

2. Completion of Remaining Work After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract), for completion and readiness for final payment, Contractor shall pay Owner \$1,000 for each day that expires after such time until the Work is completed and ready for final payment.
3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

ARTICLE 4. CONTRACT PRICE

- 4.1 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount equal to the prices stated in Contractor's Bid, attached hereto as an exhibit, subject to adjustment under the Contract.

ARTICLE 5. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

- 5.1 For unit price bid items the product of the actual measured quantities suitably installed and accepted and the unit prices from the accepted bid proposal constitutes the extended total for payment. The extended total is the unit price times the quantity indicated. An adjustment of the unit price bid for an item in the proposal will only be considered if the actual quantity furnished and installed is greater than 25% above or below the estimated quantity. Said adjustment will only be applicable to that measured quantity which is 25% above or below the estimated quantity. For Lump Sum items suitably installed and completed the lump sum amount listed in the accepted bid proposal constitutes the total for payment.
- 5.2 Progress Payments; Retainage. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, and in accordance with the applicable Massachusetts General Law during construction. All such payments will be measured by the schedule of values established in paragraph 2.05 of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.
- 5.3 Progress payments will be made in an amount equal to 95 percent of Work completed (with the balance being retainage) but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 15.01.C.5 of the General Conditions.

- 5.4 Final Payment. Upon final completion and acceptance of the Work in accordance with paragraph 15.06 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 15.06.

ARTICLE 6. CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- 6.1 CONTRACTOR has examined and carefully studied the Contract Documents (including the Addenda listed in paragraph 7) and the other related data identified in the Bidding Documents including "technical data."
- 6.2 CONTRACTOR has visited the site and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress, performance, or furnishing of the Work.
- 6.3 CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.
- 6.4 CONTRACTOR has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Article 5 of the General conditions. CONTRACTOR accepts the determination set forth in paragraph SC-5.04 of the Supplementary Conditions of the extent of the "technical data" contained in such reports and drawings upon which CONTRACTOR is entitled to rely as provided in paragraph 4.03 of the General Conditions. CONTRACTOR acknowledges that OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to completeness of information and data shown or indicated in the Contract Documents with respected to Underground Facilities at or contiguous to the site. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground utilities and facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto. CONTRACTOR does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.
- 6.5 CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the site that relates to the Work as indicated in the Contract Documents.

- 6.6 CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the site, reports, and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- 6.7 CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 7. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the Work consist of the following:

- 7.1 Invitation to Bid.
- 7.2 Instructions to Bidders.
- 7.3 CONTRACTOR's Bid Proposal.
- 7.4 This Agreement.
- 7.5 Exhibits to this Agreement.
- 7.6 Performance, Payment, and other Bonds.
- 7.7 General Conditions EJCDC Document C-700, 2013 edition.
- 7.8 Supplemental Conditions.
- 7.9 Specifications as listed in table of contents thereof.
- 7.10 Figures and tables provided in the appendices of the Specification.
- 7.11 Addenda numbers ___ to ___, inclusive.
- 7.12 The following which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto: All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents pursuant to paragraph 11.01 of the General Conditions.

ARTICLE 8. MISCELLANEOUS

- 8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.

- 8.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically, but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment with release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 8.3 OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.
- 8.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

SUPPLEMENT "C"

1. This form supplements the Town of Westwood, "Contract and General Conditions," and applies only to contracts for the construction, reconstruction, alteration, remodeling or repair of public works or public buildings.
2. Wherever the law requires one contracting with a city or town to be bonded, such obligation shall be understood to be a term and condition of this Contract. The Contractor agrees to secure such bond (where required) and provide an original thereof to the Town of Westwood prior to the commencement of performance.
3. Equality:
 - 3.1 In the case of a Closed Specification written for a specific item or items to be furnished under the Base Bid, such Specifications shall, as applicable, be in compliance with the Massachusetts General Laws, Chapter 30F Section 39M and Chapter 149, Section 44A et seq.
 - 3.2 Where the name of an item, material or manufacturer is mentioned in the Specifications or on the Drawings, except as above noted, the intent is to establish a standard and in no way should be construed to exclude any item or manufacturer not mentioned by name, but whose product meets the Specifications as to design, utility and quality. Final decision shall rest with the Project Representative as to its acceptability.
4. Change orders to contracts governed by General Laws Chapter 30B may not increase the quantity of goods or services provided by more than twenty five percent (25.0%), in compliance with Section 13 of Chapter 30B.
5. The Contractor will carry out the obligations of this Contract in full compliance with all of the requirements imposed by or pursuant to General Laws Chapter 151, Section 1, et seq. (Minimum Wage Law) and any executive orders, rules, regulations, and requirements of the Commonwealth of Massachusetts as they may from time to time be amended. The Contractor will at all times comply with the wage rates as determined by the Commissioner of the Department of Labor and Industries, under the provisions of General Laws Chapter 149. Section 26 to 27D (Prevailing Wage) as shall be in force and as amended. The Contractor will provide documentation of compliance with prevailing wage law to the Town.
6. The Contractor shall continuously maintain adequate protection of all work from damage and shall protect the property of the Town and others, including adjacent property, from injury or loss arising in connection with the Contract. The Contractor shall make good any such damage, injury or loss, except as may be directly due to errors in the Contract Document or caused by agents or employees of the Town, or due to causes beyond the Contractor's control and not the Contractor's fault or negligence.
7. The Contractor shall take all necessary precautions for the safety of employees on the work, and shall comply with all applicable provisions of federal, state and local laws and codes to

prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. The Contractor will erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workers and the public, shall post danger signs warning against the hazards created by such features of construction as pits, protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, and falling materials; and shall designate a responsible member of its organization on the work, whose duty shall be the prevention of accidents.

8. The Town shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide suitable accommodations for such access.
9. The Contractor shall appoint a competent superintendent and any necessary assistants satisfactory to the Town.
10. The Contractor shall give efficient supervision to the work, using its best skill and attention. The Contractor shall carefully study and compare all drawings, specifications and other instructions and shall at once report to the Town any error, inconsistency or omission which shall be discovered, but will not be liable to the Town for any damage resulting from errors or deficiencies in the Contract Documents. Included in this responsibility shall be supervision of all work performed by subcontractors on the work.
11. If the Contractor should neglect to prosecute the work properly, or fail to perform the contract or any of its provisions, the Town, upon three days written notice, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.
12. Inspection by the Town's Project Representative:
 - 12.1 The Town shall have the right to designate a Project Representative who may make periodic visits to the site to familiarize the Town generally with the progress and quality of the work, and to determine in general if the work is proceeding in accordance with the Contract Documents. The Project Representative will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the work, and will not be responsible for the Contractor's failure to carry out the construction work in accordance with the Contract Documents. During such visits and on the basis of these observations while at the site, the Project Representative will keep the Town informed on the progress of the work, will endeavor to guard the Town against defects and deficiencies in the work of contractors, and may condemn structural work as failing to conform to the Contract Documents. The Project Representative shall have authority to act on behalf of the Town only to the extent expressly delegated by the Town, which shall be shown to the Contractor, and shall have authority to stop the work whenever such stoppage may reasonably be necessary to insure the proper execution of the Contract.
 - 12.2 In connection with the work, the Project Representative shall not be responsible for construction methods, means, techniques, sequences or procedures employed by the Contractor or the Contractor's safety programs, requirements, regulations or precautions.

13. Decisions of the Project Representative:

13.1 The Project Representative shall, within a reasonable time, make decisions on all claims of the Town or the Contractor and on all other matters relating to the execution and progress of the structural work or the interpretation of the Contract Documents.

13.2 The Project Representatives decision in matters relating to the project, shall be final, if within the terms of the Contract Documents.

13.3 If, however, the Project Representative fails to render a decision, within ten (10) days after the parties have presented their evidence, either party may then avail itself of the remedies provided in this contract or available to it by law. If the Project Representative renders a decision after such remedies have commenced, such decision may be entered as evidence but shall not disturb or interrupt such proceedings except where such decisions is acceptable to the parties concerned.

14. Use of Premises by the Contractor:

14.1 The Contractor shall confine its apparatus, the storage of materials, and the operations of its workmen to limits indicated by law, by-laws, permits or directions of the Town and shall not unreasonably encumber the premises with its materials.

14.2 The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

15. Maintenance of Premises:

The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by its employees or work, and at the completion of the work it shall remove all its rubbish from and about the work site and all its tool, scaffolding and surplus materials and shall leave its work "broom-clean", or its equivalent, unless more exactly specified. In case of dispute, the Town may remove the rubbish and charge the cost to the several contractors, as the Town shall determine to be just. Any paved areas disturbed during construction shall be swept by a motorized highway sweeper every two (2) work days.

16. Right to Terminate:

If the Contractor should (1) be adjudged a bankrupt, (2) make a general assignment for the benefit of creditors, (3) have a receiver appointed on account of its solvency, (4) persistently or repeatedly refuse or fail to supply enough personnel and resources to perform the contract, (5) fail to make prompt payment to subcontractors or to providers of materials or labor, (6) persistently disregard laws and regulations or lawful directives of the Town, or (7) be guilty of a substantial violation of any provision of the Contract, then the Town may, without prejudice to any other right or remedy and after giving the Contractor (and any surety) seven days written notice, terminate the contract and the employment of the Contractor and take possession of the premises and of all materials, tools and appliance thereon and finish the work by whatever method it deems appropriate.

In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract price shall exceed the expense of finishing the work, including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the Contractor. If such expenses shall exceed such unpaid balances, the Contractor shall pay the difference to Town.

17. Progress Payments:

- 17.1 The Contractor shall submit to the Town and itemized Application for Payment, supported to the extent required by the Town by invoices or other vouchers, showing payments for materials and labor, payments to Subcontractors and such other evidence of the Contractor's right to payment.
- 17.2 The Contractor shall, before the first application, submit to the Town a schedule of values of the various parts of the work, including quantities if requested, aggregating the total sum of the Contract, divided so as to facilitate payments to Subcontractors, made out in such form as the Town and the Contractor may agree upon, and, if required, supported by such evidence as to its correctness. This schedule, when approved by the Town, shall be used as basis for payment, unless it is found to be in error. If applying for payments, the Contractor shall submit a statement based upon this schedule.

18. Withholding of Payments:

- 18.1 The Town may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any payment to such extent as may be necessary in its reasonable opinion to protect the Town of Westwood from loss on account of:
 - 18.1.1 Defective work not remedied.
 - 18.1.2 Claims filed or reasonable evidence indicating probable filing of claims.
 - 18.1.3 Failure of the Contractor to make payments promptly to Subcontractors or for material or labor.
 - 18.1.4 A reasonable doubt that the Contract can be completed for the balance then unpaid.
 - 18.1.5 Damage to another contractor.
- 18.2 Withholding of payments shall be in strict compliance with statutory requirements.

19. Damages:

Should either party to the Contract suffer damages because of any wrongful act or neglect of the other party, or of anyone employed by him, a claim shall be made in writing to the party liable within a reasonable time of the first observance of such damage and not later than the Final Payment, except as expressly stipulated otherwise in the case of faulty work

or materials, and shall be adjusted by agreement, or by recourse to remedies provided by law or by provisions of the contract.

20. Liens:

Neither the Final Payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Town a complete release of all liens arising out of the Contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that as far as it has knowledge or information, the releases and receipts include all the labor and material for which a lien could be filed. The Contractor shall comply with all statutory provisions of the General Laws of the Commonwealth of Massachusetts with regard to liens, Chapter 254 and 149 as amended (as a minimum requirement).

21. The Contractors Mutual Responsibility:

Should the Contractor cause damage to any separate contractor on the work, the Contractor agrees, upon due notice, to settle with such contractor by agreement, or by recourse to remedies provided by law or by the provisions of the contract. If such separate contractor sues the Town on account of any damage alleged to have been sustained, the Town shall notify the Contractor, who shall defend such proceedings at the Town's expense and, if any judgment against the Town arises there from, the Contractor shall pay or satisfy it and pay all costs incurred by the Town.

22. Separate Contracts:

22.1 The Town reserves the right to let other Contracts in connection with this work under similar General Conditions. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with theirs.

22.2 If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Town any defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of its work except as to defects which may develop in the other contractor's work after the execution of its work.

22.3 To insure the proper execution of its subsequent work, the Contractor shall measure work already in place and shall at once report to the Town any discrepancy between the executed work and the Drawings.

23. Subcontracts:

23.1 All subcontracts shall be awarded in conformity with the requirements of the General Laws, Commonwealth of Massachusetts, Chapter 149, Sections 44A to 44L inclusive.

- 23.2 The Contractor agrees that it is as fully responsible to the Town for the acts and omissions of its Subcontractors and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.
- 23.3 Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and the Town.

24. Contractor-Subcontractor Relations:

The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Agreement, the General Conditions of the Contract, the Supplementary General Conditions, the Drawings and Specifications, as far as applicable to its work, including the provisions of the General Laws, Commonwealth of Massachusetts, Chapter 149, Section 44A, et seq.

25. Indemnification:

- 25.1 The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any or all persons, including the Contractor's employees, and for any and all damage to property caused by, resulting from or arising out of any act, omission, or neglect on the part of the Contractor or of any Subcontractor or of anyone directly or indirectly employed by any of them, or of anyone for whose acts any of them may be liable in connection with operations under the Contract.
- 25.2 The Contractor further agrees to indemnify and hold harmless the Town, including the agents, employees and representative of either, from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of , use resulting there from and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.
- 25.3 The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the work resulting from any act, omission, neglect, or misconduct in the manner or method of executing the work or due to the non-execution of the work or at any time due to defective work or materials.
- 25.4 In any and all claims against the Town or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workmen's Compensation Acts, disability benefit acts or other employee benefit acts.

25.5 The obligations of the Contractor under this paragraph shall not extend to the liability of the Town, its agents or employees arising out of (a) the preparation or approval of Maps, Drawings, Opinions, Reports, Surveys, Change Orders, Designs or Specification, or (b) the giving of or the failure to give directions or instruction by the Town, its agents or employees provided such giving or failure to give directions or instructions is the primary cause of the injury or damage.

26. The Contractor's Insurance:

26.1 The Contractor shall purchase and maintain such insurance as will protect the Contractor from claims set forth below which may rise out of or result from the Contractor's operation under the Contract, whether such operation be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

26.1.1 Claims under Worker's Compensation, disability benefit and other similar employee benefits acts;

26.1.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of its employees and claims insured by usual personal injury liability coverage;

26.1.3 Claims for damage because of bodily injury, sickness or disease, or death of any person other than its employees, and claims insured by usual personal injury liability coverage; and

26.1.4 Claims for damages because of injury to or destruction of tangible property, including loss of use resulting there from.

26.2 The insurance required by the above shall be written for not less than the following minimum limits of liability:

26.2.1 Worker's Compensation Act requirements

26.2.2 General Liability -

Comprehensive form:.....\$1,000,000;

Premises and Operations:.....\$1,000,000;

Explosion and Collapse Hazard:\$1,000,000;

Underground Hazard:.....\$1,000,000;

Explosion and Collapse Hazard:\$1,000,000;

Underground Hazard:.....\$1,000,000;

Products/Completed Operations Hazard:\$1,000,000;

Contractual Insurance:\$1,000,000;

Board From Property Damage:\$1,000,000;
Independent Contractors:\$1,000,000;
Personal Injury:\$1,000,000;

Automobile Liability:

Comprehensive Form:\$1,000,000;
Owned:\$1,000,000;
Hired:\$1,000,000;
Non-Owned:\$1,000,000;
Excess Liability.....(As needed to provide
\$1,000,000 coverage minimum
for each coverage listed in
this paragraph).

26.3 The above insurance policies shall also be subject to the following requirements:

- 26.3.1 Insurance coverage for the Contractor's Comprehensive General Liability, as specified under the foregoing paragraph and for the Town's Protective Liability, as hereinafter specified under Paragraph entitled "Protective Liability Insurance" shall be written by one and the same insurance company to avoid the expense of duplicate and/or overlapping coverage and to facilitate and expedite the settlement of claims.
- 26.3.2 Certificates of Insurance acceptable to the Town shall be addressed to and filed with the Town prior to commencement of the work. Renewal certificates shall be addressed to and filed with the Town at least ten (10) days prior to the expiration date of required policies.
- 26.3.3 No insurance coverage shall be subject to cancellation without at least thirty (30) days prior written notice forwarded by registered or certified mail to the Town. The Town shall also be notified of the attachment of any restrictive amendments to the policies.
- 26.3.4 All Certificates of Insurance shall contain true transcripts from the policies, authenticated by the proper officer of the insurer, evidencing in particular those incurred, the extent of the coverage, the location and operations to which the insurance applies, the expiration date and the above mentioned notice clauses.

26.3.5 All premium costs shall be included, in the Contractor's bid.

27. Protective Liability Insurance:

- 27.1 The Contractor shall purchase and maintain such insurance as will protect the Town from claims which may arise from operations under the Contract, including operations performed for the named insured by independent contractors and general inspection thereof by the named insured.
- 27.2 The Contractor shall also purchase and maintain such insurance as will protect both the Town against Automobile Non-Ownership Liability in connection with the Contractor's operations under the Contract, whether such operations be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.
- 27.3 The limits of liability for coverage required under the preceding paragraphs shall be as specified under the provisions hereof governing the Contractor's General Liability Policy.
- 27.4 The said coverage shall not extend to the liability of the Town, its agents or employees arising out of (a) the preparation or approval of Maps, Drawings, Opinions, Reports, Surveys, Change Orders, Designs or Specification, or (b) the giving of or the failure to give directions or instructions by the Town, its agents or employees provided such giving or failure to give instructions is the primary cause of the injury or damage.
- 27.5 The above policies shall name the Town as the insured, including its employees, agents and representatives.
- 27.6 The premium costs shall be included in the Contractor's bid and the policies issued hereunder shall be assessed to and filed with the Town.

28. Property Insurance:

- 28.1 The Town may purchase and maintain property insurance upon the entire work at the site, including labor, materials, structure and contents, to the full insurable value thereof. This insurance shall include the interest of the Town, the Contractor, or Subcontractors in the work and shall insure against the perils of Fire, Extended Coverage, Vandalism and Malicious Mischief.
- 28.2 In view of its exposure to builders' risk hazards, it shall be the Town's responsibility to purchase and maintain such other insurance coverage as it may deem necessary and coverage of its liability to the Contractor. The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the work resulting from any act omission, neglect, or misconduct in the manner or method of executing the work or due to the non-execution of the work or at any time due to defective work or materials.

28.3 Copies of the above policy or a certificate of such insurance coverage shall be filed with the Contractor and Project Representative before an exposure to loss may occur.

29. List of Contract Attachments:

Attachment A – General Conditions – EJCDC Document C-700, 2013 Edition

Attachment B – Supplemental Conditions

Attachment C – Specifications and Appendices as listed in the table of contents thereof

Attachment D – Prevailing Wage Rates

CONTRACTOR

By: _____

Date: _____

Contractor—Signature

Contractor—Title

TOWN OF WESTWOOD

By: _____ Date: _____

Michael A. Jaillet

Chief Procurement Officer

CERTIFIED AS TO APPROPRIATION

By: _____ Date: _____

Marie O’Leary, Town Accountant

G/L #

PO #

APPROVED TO FORM

By: _____ Date: _____

Thomas P. McCusker, Town Counsel

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Notice to Proceed

Date: _____

Project: FAR REACH ROAD PUPM STATION UPGRADE

Owner: Town of Westwood, MA

Owner's Contract No.: DPW-21-B-004

Contract:

Engineer's Project No.: 309-1902

Contractor:

Contractor's Address:

You are notified that the Contract Times under the above Contract will commence to run on _____ . On or before that date, you are to start performing your obligations under the Contract Documents.

Before you may start any Work at the Site, Paragraph 2.01 of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Owner

Given by:

Authorized Signature

Title

Date

Copy to Engineer

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PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

Town of Westwood
580 High Street
Westwood, MA 02090

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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

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

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

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

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

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

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

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

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

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence,

to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

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

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

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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

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

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

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

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

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

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

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

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

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

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims

for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

16. Modifications to this Bond are as follows:

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PAYMENT BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

Town of Westwood
 580 High Street
 Westwood, MA 02090

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

 Contractor's Name and Corporate Seal *(seal)*

 Surety's Name and Corporate Seal *(seal)*

By: _____
 Signature

By: _____
 Signature *(attach power of attorney)*

 Print Name

 Print Name

 Title

 Title

Attest: _____
 Signature

Attest: _____
 Signature

 Title

 Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
 12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
 13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
 14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
 15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. **Definitions**
- 16.1 **Claim:** A written statement by the Claimant including at a minimum:
 1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 4. A brief description of the labor, materials, or equipment furnished;
 5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
 - 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
 18. Modifications to this Bond are as follows:

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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**STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT**

TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology.....	1
1.01 Defined Terms.....	1
1.02 Terminology.....	4
Article 2 – Preliminary Matters	5
2.01 Delivery of Bonds and Evidence of Insurance.....	5
2.02 Copies of Documents	6
2.03 Before Starting Construction.....	6
2.04 Preconstruction Conference; Designation of Authorized Representatives	6
2.05 Initial Acceptance of Schedules	7
2.06 Electronic Transmittals	7
Article 3 – Documents: Intent, Requirements, Reuse.....	7
3.01 Intent.....	7
3.02 Reference Standards.....	8
3.03 Reporting and Resolving Discrepancies	8
3.04 Requirements of the Contract Documents	9
3.05 Reuse of Documents	9
Article 4 – Commencement and Progress of the Work	9
4.01 Commencement of Contract Times; Notice to Proceed.....	9
4.02 Starting the Work	10
4.03 Reference Points	10
4.04 Progress Schedule	10
4.05 Delays in Contractor’s Progress.....	10
Article 5 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions	11
5.01 Availability of Lands.....	11
5.02 Use of Site and Other Areas.....	11
5.03 Subsurface and Physical Conditions	12
5.04 Differing Subsurface or Physical Conditions.....	13
5.05 Underground Facilities.....	14
5.06 Hazardous Environmental Conditions at Site	16
Article 6 – Bonds and Insurance.....	17

6.01	Performance, Payment, and Other Bonds	17
6.02	Insurance—General Provisions.....	18
6.03	Contractor’s Insurance	19
6.04	Owner’s Liability Insurance.....	21
6.05	Property Insurance	21
6.06	Waiver of Rights	23
6.07	Receipt and Application of Property Insurance Proceeds	24
Article 7 – Contractor’s Responsibilities.....		24
7.01	Supervision and Superintendence	24
7.02	Labor; Working Hours	24
7.03	Services, Materials, and Equipment.....	25
7.04	“Or Equals”	25
7.05	Substitutes	26
7.06	Concerning Subcontractors, Suppliers, and Others.....	27
7.07	Patent Fees and Royalties.....	29
7.08	Permits	29
7.09	Taxes	29
7.10	Laws and Regulations	30
7.11	Record Documents	30
7.12	Safety and Protection	30
7.13	Safety Representative.....	31
7.14	Hazard Communication Programs	31
7.15	Emergencies	31
7.16	Shop Drawings, Samples, and Other Submittals.....	32
7.17	Contractor’s General Warranty and Guarantee	34
7.18	Indemnification	34
7.19	Delegation of Professional Design Services	35
Article 8 – Other Work at the Site		35
8.01	Other Work	35
8.02	Coordination.....	36
8.03	Legal Relationships.....	36
Article 9 – Owner’s Responsibilities		37
9.01	Communications to Contractor	37
9.02	Replacement of Engineer	37
9.03	Furnish Data.....	37

9.04	Pay When Due	37
9.05	Lands and Easements; Reports, Tests, and Drawings	38
9.06	Insurance	38
9.07	Change Orders.....	38
9.08	Inspections, Tests, and Approvals.....	38
9.09	Limitations on Owner’s Responsibilities	38
9.10	Undisclosed Hazardous Environmental Condition	38
9.11	Evidence of Financial Arrangements	38
9.12	Safety Programs	38
Article 10 – Engineer’s Status During Construction		38
10.01	Owner’s Representative	38
10.02	Visits to Site	39
10.03	Project Representative.....	39
10.04	Rejecting Defective Work.....	39
10.05	Shop Drawings, Change Orders and Payments.....	39
10.06	Determinations for Unit Price Work	39
10.07	Decisions on Requirements of Contract Documents and Acceptability of Work	39
10.08	Limitations on Engineer’s Authority and Responsibilities	40
10.09	Compliance with Safety Program	40
Article 11 – Amending the Contract Documents; Changes in the Work.....		40
11.01	Amending and Supplementing Contract Documents	40
11.02	Owner-Authorized Changes in the Work.....	41
11.03	Unauthorized Changes in the Work	41
11.04	Change of Contract Price	41
11.05	Change of Contract Times	42
11.06	Change Proposals	42
11.07	Execution of Change Orders	43
11.08	Notification to Surety.....	44
Article 12 – Claims		44
12.01	Claims	44
Article 13 – Cost of the Work; Allowances; Unit Price Work		45
13.01	Cost of the Work	45
13.02	Allowances.....	47
13.03	Unit Price Work	48
Article 14 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work		48

14.01	Access to Work	48
14.02	Tests, Inspections, and Approvals.....	48
14.03	Defective Work	49
14.04	Acceptance of Defective Work	50
14.05	Uncovering Work.....	50
14.06	Owner May Stop the Work	51
14.07	Owner May Correct Defective Work.....	51
Article 15 – Payments to Contractor; Set-Offs; Completion; Correction Period		51
15.01	Progress Payments	51
15.02	Contractor’s Warranty of Title.....	54
15.03	Substantial Completion	54
15.04	Partial Use or Occupancy.....	55
15.05	Final Inspection.....	56
15.06	Final Payment	56
15.07	Waiver of Claims	57
15.08	Correction Period	57
Article 16 – Suspension of Work and Termination		58
16.01	Owner May Suspend Work.....	58
16.02	Owner May Terminate for Cause.....	58
16.03	Owner May Terminate For Convenience.....	59
16.04	Contractor May Stop Work or Terminate	59
Article 17 – Final Resolution of Disputes.....		60
17.01	Methods and Procedures	60
Article 18 – Miscellaneous		60
18.01	Giving Notice.....	60
18.02	Computation of Times.....	60
18.03	Cumulative Remedies	60
18.04	Limitation of Damages.....	61
18.05	No Waiver	61
18.06	Survival of Obligations	61
18.07	Controlling Law	61
18.08	Headings.....	61

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. §§5501 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.H 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 consider 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 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 11.01.C.2.a and 11.01.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 special 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.

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SECTION 00800

SUPPLEMENTAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC No. C-700, 2013 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not specifically amended or supplemented hereby remain in full force and effect.

ARTICLE 1. DEFINITIONS AND TERMINOLOGY

SC-1.01.A.13

Add the following language at the beginning of the definition entitled "Contract Documents" in the General Conditions:

The Invitation to Bid, ~~Instructions to Bidders~~

SC-1.01.A.28

Add the following language to the definition entitled "Owner" in the General Conditions:

The "Owner" shall mean the Town of Westwood, Massachusetts.

SC-1.01.A.40

Delete the definition of Substantial Completion in the General Conditions in its entirety and add the following in its place:

The Work required by the Contract has been completed except for work having a Contract Price of less than one percent of the then adjusted total contract price, or substantially all of the Work has been completed and opened to Owner's use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work required by the Contract.

SC-1.01.A.49

Add the following definition to the General Conditions:

"State" shall mean the Commonwealth of Massachusetts.

SUPPLEMENTAL CONDITIONS

ARTICLE 2. PRELIMINARY MATTERS

SC-2.05

Add the following paragraphs immediately after paragraph 2.05.A.3 of the General Conditions which is to read as follows:

2.05.A.4 Before any work at the site is started, CONTRACTOR shall deliver to OWNER, with a copy to ENGINEER, certificates of insurance (and other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with the requirements of Article 6.

2.0.A.5 Contractor shall include and identify on the certificate of insurance, indemnification as required by Article 7.18.

ARTICLE 3. DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01

Add the following paragraphs immediately after paragraph 3.01.A of the General Conditions which is to read as follows:

3.0.A.1 Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though they were included herein. If through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

3.0.A.2 Sections of Division 1 - General Requirements govern the execution of the work of all sections of the specifications.

ARTICLE 4. COMMENCEMENT AND PROGRESS OF THE WORK

SC 4.01

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

4.01 The Contract Time will commence to run on the day indicated in the Notice to Proceed.

SC-4.03.A

Add a new paragraph at the end of paragraph 4.03.A of the General Conditions which is to read as follows:

SUPPLEMENTAL CONDITIONS

“4.03.B ENGINEER may check the lines, elevations, reference marks, batter boards, etc., set by CONTRACTOR, and CONTRACTOR shall correct any errors disclosed by such check. Such a check shall not be considered as approval of CONTRACTOR's work and shall not relieve CONTRACTOR of the responsibility for accurate and satisfactory construction and completion of the entire Work. CONTRACTOR shall furnish personnel to assist ENGINEER in checking lines and grades.”

SC-4.04

Add the following paragraph after paragraph 4.04.A.2 of the General Conditions:

"3. The CONTRACTOR's resident superintendent shall attend monthly progress meetings at the site of the work with the ENGINEER and others as appropriate to review schedule status and such other pertinent subjects as may be listed on the agenda by the ENGINEER."

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

SC-5.01

Add a new paragraph immediately after paragraph 5.01.A of the General Conditions which is to read as follows:

“5.01.A.1 If all lands and rights-of-way are not obtained as herein contemplated before construction begins, CONTRACTOR shall begin the Work upon such land and rights-of-way as OWNER has previously acquired and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining lands and rights-of-way. Should OWNER be prevented or enjoined from proceeding with the Work, or from authorizing its prosecution, either before or after the commencement, by reason of any litigation, or by reason of its inability to procure any lands or rights-of-way for the Work, CONTRACTOR shall not be entitled to make or assert claim for damage by reason of said delay, or to withdraw from the Agreement except by consent of OWNER. Time for completion of the Work will be extended as provided in Article 11, to such time as OWNER determines will compensate for the time lost by such delay.”

SC-5.04

Add a new paragraph immediately after paragraph 5.04.D of the General Conditions which is to read as follows:

“5.04.E Adjustments resulting from actual subsurface or latent physical conditions from those indicated will be in accordance with Massachusetts General Law, Chapter 30, Section 39N and the applicable provisions of the Contract Documents.”

SUPPLEMENTAL CONDITIONS

ARTICLE 6. BONDS AND INSURANCE

SC-6.02

Add a new paragraph immediately after paragraph 6.02.J of the General Conditions which is to read as follows:

"A. If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with this Article 6 on the basis of its not complying with the Contract Documents, OWNER will notify CONTRACTOR in writing thereof within thirty days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.01.B CONTRACTOR will provide such additional information in respect of insurance provided by him as OWNER may reasonably request."

~~SC-6.03~~

~~The limits of liability for the insurance required by paragraph 6.03 of the General Conditions shall provide the following coverages for not less than the following amounts or greater where required by Laws and Regulations:~~

~~6.03.A Workers' Compensation.~~

~~———— (1) Worker's Compensation ————— \$1,000,000~~

~~———— (2) Employer's Liability ————— \$1,000,000~~

~~6.03.B and 6.03.C Comprehensive General Liability including Operations/Premises, Contractor's Protective, Products/Completed Operations, and Personal Injury liabilities:~~

(1)	Bodily injury:	\$1,000,000	Each occurrence
		\$3,000,000	Annual aggregate

(2)	Property damage, including explosion, collapse and underground coverage:	\$1,000,000	Each occurrence
		\$3,000,000	Annual aggregate

~~Property damage liability insurance shall provide coverage for property in the care, custody and control of the insured.~~

(3)	Personal injury, with employment exclusion deleted:	\$3,000,000	Annual aggregate
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SUPPLEMENTAL CONDITIONS

The Contractual Liability required by paragraph 6.03.C of the General Conditions shall provide coverage for not less than the following amounts:

(1)	Bodily injury:	\$2,000,000	Each occurrence
		\$3,000,000	Annual aggregate
(2)	Property damage, including explosion, collapse and underground coverage:	\$1,000,000	Each occurrence
		\$3,000,000	Annual aggregate
(3)	General Aggregate	\$2,000,000	

~~6.03.D Comprehensive Automobile Liability including owned, hired and non-owned vehicles:~~

(1)	Bodily injury:	\$1,000,000	Each person
		\$1,000,000	Each accident
(2)	Property damage	\$1,000,000	Each occurrence

SC-6.04

Delete paragraph 6.04 of the General Conditions in its entirety and insert the following in its place:

~~6.04.A CONTRACTOR shall purchase and maintain a separate Owner's Protective Liability policy, issued to OWNER at the expense of CONTRACTOR, including OWNER and ENGINEER as named insured. This insurance shall provide coverage for not less than the following amounts:~~

~~6.04.A.1 Bodily Injury:~~

~~Each Occurrence _____ \$1,000,000~~

~~6.04.A.2 Property Damage:-~~

~~Each Occurrence _____ \$1,000,000~~

~~Annual Aggregate _____ \$1,000,000~~

SC-6.05

Delete Paragraph 6.05.A of the General Conditions in its entirety and insert the following in its place:

"A. CONTRACTOR shall purchase and maintain, until final payment, property insurance upon the Work at the site in an amount equal to the total bid price for the completed construction. This insurance shall include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER and ENGINEER's consultants in the Work, shall insure against the perils of fire and extended coverage, shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and shall

SUPPLEMENTAL CONDITIONS

include damages, losses and expenses rising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). This insurance shall be provided on the completed value form. If not covered under the "all risk" insurance or otherwise provided in these Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment."

Delete Paragraph 6.05.B of the General Conditions in its entirety and insert the following in its place:

"B. All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 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 thirty days' prior written notice has been given to OWNER by certified mail and will contain waiver provisions in accordance with paragraph 6.06.B."

SC-6.07

Delete paragraph 6.07.A of the General Conditions in its entirety.

Delete paragraph 6.07.B of the General Conditions in its entirety.

Delete paragraph 6.07.C of the General Conditions in its entirety.

ARTICLE 7. CONTRACTOR'S RESPONSIBILITIES

SC-7.06

Add the following new paragraph as follows:

"7.06.J.1 OWNER or ENGINEER may furnish to any such Subcontractor, Supplier, or other person or organization, to the extent practicable, information about amounts paid to CONTRACTOR in accordance with CONTRACTOR's Applications for Payment on account of the particular Subcontractor's, Suppliers, other person's, or other organization's Work."

SC-7.06

Add the following language at the beginning of paragraph 7.06.L of the General Conditions:

"Except as otherwise required by Massachusetts General Law, Chapter 149, Section 44F,"

SC-7.09

Add the following language at the end of paragraph 7.09.A of the General Conditions:

SUPPLEMENTAL CONDITIONS

“7.09.A.1 The materials and supplies to be used in the Work under this Contract are exempt from the Sales and Use Tax of the Commonwealth of Massachusetts. Contractor shall obtain the proper certificates, maintain the necessary records, and otherwise comply with all applicable requirements governing the exemption from sales tax.”

SC-7.16

Add the following new paragraph immediately after paragraph 7.16.E of the General Conditions, which is to read as follows:

“7.16.F The accuracy of all such information submitted by the Contractor is the responsibility of the Contractor. In reviewing Shop Drawings, Samples, and similar submittals, the Engineer shall be entitled to rely upon the Contractor’s representation that such information is correct and accurate.”

ARTICLE 8. OTHER WORK AT THE SITE

SC-8.03

Delete paragraph 8.03.D of the General Conditions in its entirety, and insert the following in its place:

“8.03.D Should CONTRACTOR cause damage to the work or property of any separate contractor at the site, or should any claim arising out of CONTRACTOR'S performance of the Work at the site be made by any separate contractor against CONTRACTOR, OWNER, ENGINEER, ENGINEER'S Consultants, or any other person, CONTRACTOR shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold OWNER, ENGINEER, and ENGINEER'S Consultants, harmless from and against all claims, damages, losses, and expenses (including, but not limited to, fees of engineers, architects, attorneys, and other professionals, and court and arbitration costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any separate contractor against OWNER, ENGINEER, or ENGINEER'S Consultants, to the extent based on a claim arising out of the CONTRACTOR'S performance of the Work. Should a separate contractor cause damage to the Work or property of CONTRACTOR or should the performance of Work by any separate contractor at the site give rise to any other claim, CONTRACTOR shall not institute any action, legal or equitable, against OWNER, ENGINEER, or ENGINEER'S Consultants 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, ENGINEER, or ENGINEER'S Consultants, on such damage or claim. If CONTRACTOR is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor and OWNER and CONTRACTOR are unable to agree to the extent of any adjustment in Contract Times attributable thereto, CONTRACTOR may make a claim for an extension of times in accordance with Article 12.02. An extension of the Contract Times shall be CONTRACTOR'S exclusive remedy with respect to OWNER, ENGINEER, and ENGINEER'S Consultants, for any delay, disruption, interference or hindrance caused by any separate contractor. This paragraph does not prevent recovery from OWNER, ENGINEER, or ENGINEER'S Consultant, for activities that are their respective responsibilities.”

SUPPLEMENTAL CONDITIONS

ARTICLE 9. OWNER'S RESPONSIBILITIES

SC-9.06

Delete paragraph 9.06 of the General Conditions in its entirety.

ARTICLE 10. ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.01

Add a new paragraph 10.01.B after paragraph 10.01.A of the General Conditions, which is to read as follows:

"B. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the ENGINEER and CONTRACTOR, (2) between the OWNER and a Subcontractor or Subcontractors, or (3) between any person or entities other than the OWNER and CONTRACTOR. The ENGINEER shall, however, be entitled to performance and enforcement of obligations under the CONTRACT DOCUMENTS intended to facilitate performance of the ENGINEER'S duties."

SC-10.03

Add a new paragraph immediately after paragraph 10.03.A of the General Conditions as follows:

"10.03.B ENGINEER will furnish a Resident Project Representative and assistants to assist ENGINEER in observing the performance of the Work. The duties and responsibilities of the Resident Project Representative will be as enumerated in a document entitled "Duties, Responsibilities, and Limitations of the Authority of Resident Project Representative" and will be made available to CONTRACTOR at the start of his work."

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

SC-11.02

Add a new paragraph immediately after paragraph 11.02.A of the General Conditions which is to read as follows:

"11.02.A.1 ENGINEER'S interpretations will be made in accordance with Massachusetts General Law, Chapter 30, Section 39P."

SC-11.02

Add the following new paragraph immediately after paragraph 11.02.A of the General Conditions, which is to read as follows:

SUPPLEMENTAL CONDITIONS

“11.02.B Upon request of the Owner or Engineer, the Contractor shall without cost to the Owner submit to the Engineer, in such form as the Engineer may require, an accurate written estimate of the cost of any such proposed extra Work or change. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of materials shall be shown if required by the Engineer. The Contractor shall promptly revise and resubmit such estimate if the Engineer determines that it is not in compliance with the requirements of this Article, or that it contains errors of facts or mathematical errors. If required by the Engineer, in order to establish the exact cost of new Work added or previously required Work omitted, the Contractor shall obtain and furnish to the Engineer bona fide proposals from recognized suppliers for furnishing any material included in such Work, and shall be furnished at Contractor’s expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.”

ARTICLE 12. CLAIMS

SC-12.01

Add a new paragraph immediately after paragraph 12.01.D.1 of the General Conditions to read as follows:

“12.01.D.1.a CONTRACTOR shall carry on the Work and maintain the progress schedule during the dispute resolution proceedings unless otherwise agreed in writing by OWNER and CONTRACTOR.”

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

SC-13.01

Add the following to the end of paragraph 13.01.B of the General Conditions to read as follows:

“Following the Notice of Award and prior to the execution of the AGREEMENT the OWNER, prospective contractor and, if any, each prospective filed subbid contractor shall agree on what percentage markup shall be used as direct labor costs in determination of extra work costs.”

In the second sentence of paragraph 13.01.B.1 delete the word "superintendents".

SC-13.02

Delete paragraph 13.02 of the General Conditions in its entirety.

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

SUPPLEMENTAL CONDITIONS

SC-15.01

Add new paragraphs immediately after paragraph 15.01.B.1 of the General Conditions to read as follows:

“15.01.B.1.a Only the following items of material and equipment will be accepted for delivery at the site or at a local bonded warehouse and included in progress estimates in advance of actual requirement, subject to all conditions stated below.

15.01.B.1.b Materials and equipment listed above will not be included in progress estimates until the requirements stated herein have been fulfilled.

15.01.B.1.c The Contractor must present an invoice to the Engineer for each item of material or equipment he is requesting payment for. The invoice must be broken down to show the costs for the actual equipment, and reasonable costs for O&M Manuals, spare parts, start-up certification, training, testing, final acceptance testing, and any other services required by Contract.

15.01.B.1.d Sufficient monies have been allocated in the payment requisition line items to cover all of the costs listed in "a" above, plus the costs of physically installing the equipment.

15.01.B.1.e The equipment has been submitted and approved for use in this Project.

15.01.B.1.f The Contractor has, at the time of delivery, given the Engineer written notice of the delivery using the form provided by the Engineer.

15.01.B.1.g The equipment is acceptably stored and protected. Storage in a bonded warehouse will require proof of bonding, and insurance coverage specifically for the item being stored.

15.01.B.1.h The manufacturer's short and/or long term storage requirements have been received by the Engineer, prior to payment.

15.01.B.1.i The Contractor has established a program to implement the manufacturer's required storage procedures. Said program to consist of at the very least a written schedule of daily, weekly, monthly, routine maintenance requirements for each piece of equipment. A copy of this schedule to be presented to the Engineer prior to each requisition submittal, signed by the Contractor, stating that the required maintenance has been performed.

15.01.B.1.j Signed, notarized Title Transfers, format to be furnished by the Engineer, must be furnished for each item of equipment.

15.01.B.1.k When the above have been complied with to the satisfaction of the Engineer, payment will be authorized for the full invoice values of the item of equipment, less normal retainage and less all costs for O&M Manuals, spare parts, start-up certification, training, testing, final acceptance testing, and installation.”

Delete paragraph 15.01.B.3 and insert the following in its place:

SUPPLEMENTAL CONDITIONS

"15.01.B.3. Retainage with respect to progress payments will be five percent or, if stipulated, the maximum allowed by law."

ARTICLE 18. MISCELLANEOUS

SC-18.08

18.08 Headings:

Delete paragraph 18.08.A and replace with the following paragraph:

"18.08.A The headings or titles of any article, paragraph, subparagraph, section, subsection, or part of the Contract Documents shall not be deemed to limit or restrict the article, paragraph, section, or part."

18.09 Legal Address of Contractor

Add the following paragraph immediately after section 18.08:

"18.09.A CONTRACTOR'S business address and his office at or near the site of the Work are both hereby designated as places to which communications shall be delivered. The depositing of any letter, notice, or other communication in a postpaid wrapper directed to the CONTRACTOR'S business address in a post office box regularly maintained by the Post Office Department or the delivery at either designated address of any letter, notice, or other communication by mail or otherwise shall be deemed sufficient service thereof upon CONTRACTOR, and the date of such service shall be the date of receipt. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by CONTRACTOR and delivered to ENGINEER. Service of any notice, letter, or other communication upon the CONTRACTOR personally shall likewise be deemed sufficient service."

END OF SECTION 00800

SUPPLEMENTAL CONDITIONS

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SUPPLEMENTAL CONDITIONS

Far Reach Road Pump Station Upgrade
Bid # DPW-21-B-004

00800-12

DIVISION 1 - GENERAL REQUIREMENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
01010	Summary of Work	01010-1
01024	Measurement and Payment	01024-1
01040	Project Coordination	01040-1
01046	Control of Work	01046-1
01063	Miscellaneous Requirements	01063-1
01095	Reference Standards and Definitions	01095-1
01110	Environmental Protection Measures	01110-1
01170	Special Provisions	01170-1
01200	Project Meetings	01200-1
01300	Submittals	01300-1
01311	Construction Progress Schedules	01311-1
01350	Health and Safety Plan	01350-1
01370	Schedule of Values	01370-1
01400	Quality Assurance	01400-1
01500	Temporary Facilities and Controls	01500-1
01610	Delivery, Storage and Handling	01610-1
01700	Contract Closeout	01700-1
01710	Cleaning Up	01710-1

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SECTION 01010
SUMMARY OF WORK

PART 1 – GENERAL

1.1 SUMMARY

- A. The Work under this Contract includes, but is not necessarily limited to upgrading an existing flooded suction sewer pump station, associated electrical work, and appurtenances; rehabilitating the existing wet well structure; installing a permanent force main bypass assembly including manhole, valves, fittings, and all appurtenances; grouting and painting existing building foundation wall, paving and providing all appurtenances and incidental work necessary to complete the work as specified in the Contract Documents.

1.2 SCOPE OF WORK

- A. The Work shall consist of furnishing all labor, equipment, materials, tools, apparatus and all other incidental work required to complete the pump station upgrade, force main modifications, and wet well rehabilitation as specified and shown on the Drawings. The Work shall include, but not necessarily be limited to the following:
1. Coordination of all construction activities with the Owner, appropriate local authorities, utilities and subcontractors.
 2. Attending the pre-construction conference and the required job progress meetings.
 3. Submission of a construction schedule, list of subcontractors, and proposed source locations for off-site materials, including, but not limited to: sand and gravel, crushed stone, stone, processed gravel, concrete, and asphalt pavement.
 4. Submission of all required shop drawings, in a timely manner, to the Engineer, for review.
 5. Mobilization to the Site and demobilization from the Site.
 6. Maintenance of flow and access to the existing pump stations for normal operations prior to acceptance.
 7. Perform all required testing of the new sewers.
 8. Adjustments/repairs and/or replacement of utility appurtenances (manholes, frames, grates and covers, gate boxes, etc.) and other related work, as specified or directed by the Engineer.

SUMMARY OF WORK
01010-1

9. Furnishing, installing and maintaining all materials for erosion and sediment control throughout construction.
10. Furnishing all materials and performing all excavations, backfilling of excavated areas, and restoration of surface pavement.
11. Trench bituminous concrete pavement and restoration of other disturbed areas for permanent pavement repairs, as specified or as directed.
12. Restoration of driveways and landscaped areas as shown, required or as directed by the Engineer.
13. Furnishing, installation and maintenance of all traffic control and safety measures during the construction period, including signs, barricades, detours, maintenance of safe vehicular and pedestrian access to abutting properties, businesses and commercial establishments and assuring an uninterrupted supply of utility services to all public amenities, businesses and abutters within the project area, at all times.
14. Maintenance and repair of all work for a period of one (1) year following the issuance of the Certificate of Substantial Completion.
15. Civil/site construction related to the force main modifications including: dewatering, temporary excavation support systems, site preparation, grading, excavation, earthwork, site utilities, site drainage, paving, and loam and seed.
16. Grouting existing building foundation wall as shown, or as directed by the engineer.
17. Surface preparation and painting of select portion of the pump station interior.
18. Instrumentation and controls including hardware and software products and SCADA integration and programming. The work includes start-up, check-out, field testing, and O&M training of the instrumentation and controls systems.
19. Perform all field engineering associated with the project work including, but not limited to construction layout and elevations and preparation of accurate and detailed red-line drawings at the completion of the project.
20. The Work shall also conform to such additional Drawings and addenda to these Specifications and Drawings as may be published or exhibited prior to the opening of bid proposals and to such Drawings in explanation of details, or as may be furnished by the Engineer from time to time during the construction.

SUMMARY OF WORK
01010-2

21. Work, materials, equipment, and storage areas, which are necessary for construction, but which are not specifically referred to in the Specifications or shown on the Drawings, but implied by the contract, shall be furnished by the Contractor at his own cost and expense, and shall be such as will correspond with the general character of the Work, as may be determined by the Engineer, whose decisions as to the necessity for and character of such work and materials shall be final and conclusive. It is the intent of these Specifications to produce a complete, finished job, whether shown in every detail or not.

1.3 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for:
 1. Owner occupancy, including easements.
 2. Normal operation and maintenance activities at the pump station.
 3. Public use.
- B. Coordinate use of premises with Owner.
- C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors' materials and equipment stored on the site.
- D. If directed by the Owner or Engineer, move any stored items which interfere with operations of Owner or other contractors.
- E. Obtain and pay for use of additional storage areas or work areas as necessary and required to perform the Work.

1.4 OWNER OCCUPANCY

- A. Owner will occupy premises during performance of the Work for the conduct of his/her normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Owner usage.

1.5 UTILITIES

- A. The utilities shown on the plans have been located primarily from information furnished by others and are considered approximate both as to size and location. It shall be the Contractor's responsibility to locate all existing utilities and to protect same from damage or harm. All utilities interfered with or damaged shall be properly restored, at the expense of the Contractor, to the satisfaction of its Owner.

PART 2 - PRODUCTS (NOT USED)

SUMMARY OF WORK 01010-3

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01010

SUMMARY OF WORK
01010-4

SECTION 01024

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Under the price specified to be paid for each item, the Contractor shall furnish all materials and equipment, furnish all labor and plant, and do all operations necessary to complete all work specified or shown. All supervision, overhead items, protection, and precautions, permit fees, bonds, insurance fees, and all other costs incidental to the construction work including training, start-up, testing, and calibration services, complete, and as specified, are included.
- B. A complete, finished, working job, as intended by the general nature of these Specifications, shall be produced whether or not any particular wording or direction is omitted or inadvertently not clearly stated.
- C. Measurement for payment shall be by the Engineer, except where noted elsewhere in this Specification. Measurement for payment for lump sum items shall be on the basis of percentage of work complete and in place.
- D. Each unit or lump sum price stated in the bid shall constitute full compensation as herein specified for each item of work completed in accordance with the Drawings and Specifications.
- E. The prices for those items which involve excavation shall include compensation for handling, transportation and disposal of surplus excavated material and handling water and any required shoring or bracing for compliance with OSHA regulations.
- F. Unit prices submitted for various items of work will be utilized for determining prices of any additional work necessary during construction.
- G. In accordance with Chapter 150 of the Acts of 2013 (An Act Relative to Price Adjustments for Certain Materials in Construction Projects), specifically Section 38A, of Massachusetts General Laws Chapter 30, the following materials will be eligible for price adjustments in accordance with Appendix C of this Specification's package and applicable Specification Sections: fuel (both diesel and gasoline); liquid asphalt; and Portland cement (contained in cast-in-place concrete). The noted material price adjustments are applicable on a monthly basis only when the monthly cost change in base prices exceeds +/- 5%.
- H. Final payment shall not be issued until the Contractor submits record drawings and the Engineer approves these drawings.

MEASUREMENT AND PAYMENT 01024-1

1.2 ITEM DESCRIPTIONS

A. Item 1: Interior Pump Station Upgrades

1. Contractor shall perform all of the work, including all labor, equipment, and materials necessary for a complete construction in accordance with the Contract Drawings and Specifications for the improvements to the existing pump station. The proposed pump station work shall include all work within the pump station as shown on the Drawings; which includes but is not limited to mobilization and demobilization; the furnishing and installation of flooded suction pumps, interior ductile iron piping, valves, pipe fittings and appurtenances, couplings, joint restraints, equipment pads, bypass pumping, field painting, electrical and instrumentation wiring and all testing as required under the Drawings and Design Specifications. All integration is to be completed by the Town's integrator under a separate Contract. The Contractor shall coordinate with the Town's integrator during construction.
2. Payment for Item 1 shall be made on the percentage of work completed, as determined by the Engineer.

B. Item 2: Force Main Bypass Assembly

1. Contractor shall perform all of the work, including but not limited to all labor, equipment, and materials necessary for a complete construction in accordance with the Contract Drawings and Specifications for the force main bypass installation. The work includes but is not limited to exterior ductile iron piping, valves, pipe fittings and appurtenances, couplings, joint restraints, concrete structure, frame and cover, temporary bypass including, hauler truck, pump setup, pumping and diversion of sewage flow, setup, pumps, piping, gasoline/diesel fuel, secondary containment, maintenance, transportation and storage, confined space entry and equipment, pumping flows, monitoring water levels and installing bypass/diversion piping, erosion control, trenching, backfill, compaction, placing pavement, surface restoration and all incidental work to complete the work as shown on the Drawings and as specified.
2. Payment for Item 2 shall be made on the percentage of work completed, as determined by the Engineer.

C. Item 3: Wet Well Rehabilitation and Fall Protection

1. Contractor shall perform all of the work, including but not limited to all labor, equipment, and materials necessary for a complete construction in accordance with the Contract Drawings and Specifications for the wet well rehabilitation. The work includes but is not limited to concrete, formwork, fall protection grating, fine grading, testing and all incidental work to complete the work as shown on the Drawings and as specified.

MEASUREMENT AND PAYMENT 01024-2

2. Payment for Item 3 shall be made on the percentage of work completed, as determined by the Engineer.
- D. Item 4: Painting
1. The unit price for this item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary for the painting of the pump room walls. The work includes inspection, cleaning, preparation, and painting of the concrete wall surfaces. All field painting of piping and equipment is included under Bid Item 1.
 2. Payment for Item 4 shall be made on the square foot, as determined by the Engineer.
- E. Item 5: Injection Grouting
3. The unit price for this item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary for installing an injection grouting system along a 30-foot infiltration seam in the pump room. The injection grout system shall provide a waterproof barrier to the exterior of the pump room wall to prevent groundwater infiltration as described in the Contract Documents. The work includes inspection, cleaning, preparation, drilling of injection holes, grout injection, disposal of materials and clean up.
 4. Payment for Item 5 shall be made on the percentage of work completed, as determined by the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01024

MEASUREMENT AND PAYMENT
01024-3

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SECTION 01040

PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
 - 1. Coordination of all workers, subcontractors, utilities, and others with direct involvement in the work.
 - 2. Coordination of all administrative and supervisory personnel for proper control of the work.
 - 3. General installation provisions.
 - 4. Typical construction sequencing.
 - 5. Cleaning and protection.
- B. Progress meetings and preconstruction conferences are included in Section 01200 – Project Meetings.
- C. Requirements for the Contractor’s Construction Schedule are included in Section 01300 – Submittals and Section 01311 – Construction Progress Schedules.
- D. Requirements for Contractor’s temporary facility submittals are included in Section 01500 – Temporary Facilities and Controls.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Inspect the conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an

PROJECT COORDINATION
01040-1

acceptable manner, and at no additional cost to the Owner.

- B. Manufacturer's Written Instructions: Comply with manufacturer's written installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items, and at no additional cost to the Owner.
- D. Provide attachment and connection devices and methods for securing work. Secure work true to line and level. Allow for expansion and utility movement.
- E. Recheck measurements and dimensions before starting installation or erection.
- F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material to prevent deterioration.
- G. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Install protective covering to ensure protection from damage or deterioration.
- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period.
- C. Contractor shall be required to sweep public and private roadways to remove all materials related to project activities. The frequency of sweeping shall be based on the condition of the affected roadway.
- D. Limiting Exposures: Supervise construction activities to ensure that no part of construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.

PROJECT COORDINATION 01040-2

4. Air contamination or pollution.
5. Water or ice.
6. Solvents.
7. Chemicals.
8. Heavy traffic.
9. Misalignment.
10. Unprotected storage.
11. Improper shipping or handling.
12. Theft.
13. Vandalism.

END OF SECTION 01040

PROJECT COORDINATION
01040-3

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SECTION 01046
CONTROL OF WORK

PART 1 – GENERAL

1.1 EQUIPMENT

- A. Furnish equipment which will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the Contract Time. If at any time such equipment appears to the Engineer to be inefficient, inappropriate, or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he/she may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his/her obligations to secure the quality of the work and rate of progress required.

1.2 HOURS OF CONSTRUCTION

- A. Normal construction activity shall take place only between the hours of 7 a.m. to 3 p.m., excluding Saturdays, Sundays, and legal holidays. Work outside the above time periods will be permitted only on an emergency basis and only with the approval of the Owner and Engineer.

1.3 PRIVATE LAND

- A. The Contractor shall not (except after written consent from the proper parties) enter or occupy with men, tools, materials, or equipment any land outside the rights-of-way or property of the Owner.

1.4 HAULING, HANDLING, AND STORAGE OF MATERIALS

- A. The Contractor shall, at his own expense, handle, and haul all materials furnished by him and shall remove any and all of his surplus materials at the completion of the work. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by him that are liable to injury, and shall be responsible for any loss or damage to any equipment or materials by theft, breakage, or otherwise. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance, even though partial payments have been made under the Contract.

1.5 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

CONTROL OF WORK
01046-1

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, fences, guardrails, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. The Contractor is required to comply with all provisions of General Laws Chapter 353, entitled "Excavations-Public Ways-Notice Requirements", otherwise known as DIGSAFE. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.
- B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including, but not limited to existing water services, drain lines, sewers, and duct banks). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures, as described in this Section, shall be a part of the work under the Contract, and all costs in connection therewith shall be included in the unit prices established in the Contract.
- D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the Owner is required, which is not shown on the Plans or the Specifications, he may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for as extra work under Articles of the General Conditions. If relocation of a privately-owned utility is required, the Owner will notify the utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and utility, and shall have no claim for delay due to such relocation. The Contractor shall notify public utility companies, in writing, at least 72 hours (excluding Saturdays, Sundays, and legal holidays) before excavating in any public way.

1.6 WATER SYSTEM – NOT USED

1.7 SEWER SYSTEM

- A. The Contractor shall interrupt and disrupt the normal functioning of the sewer system, including any force main, as little as possible. He shall notify the Owner and Engineer 72 hours in advance of any requirement for isolating or tapping a section of the main, so that the necessary arrangements may be made. The Owner reserves the right to limit the amount of system piping that may be shut down at any one time.
- B. When a force main is to be interrupted for an extended period (longer than 30 minutes), the Contractor will provide temporary provisions to maintain full flow. Inconvenience of sewer users shall be kept at a minimum. The safety and integrity of the system is of prime importance in scheduling work.

CONTROL OF WORK 01046-2

1.8 PIPE LOCATIONS

- A. Pipelines shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him/her from laying and jointing different or additional items where required. Additional fittings ordered by the Owner or Engineer shall be paid for under the additional fittings bid item.

1.9 DIMENSIONS OF EXISTING STRUCTURES

- A. Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.10 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at his/her own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen or residents to their driveways. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.
- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.
- C. Contractor shall obtain proper trench and road opening permits as required by M.G.L. C.82A and Title 520 of the CMR and the Town of Westwood.

1.11 TEST PITS/EXPLORATORY EXCAVATION

- A. Test pits for the purpose of locating underground pipeline, utilities or structures in advance of the construction shall be excavated and backfilled by the Contractor. Test pits shall be backfilled and compacted immediately after their purpose has been satisfied and the surface restored and maintained in accordance with the Contract Documents. All test pits shall be closed at the end of each working day with backfill

CONTROL OF WORK 01046-3

or steelplating.

- B. Refer to Contract Drawings for location of test pits to be completed in advance of construction.

1.12 DUST CONTROL

- C. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of water as necessary, so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride, and it is allowed by local authorities, for more effective dust control, the Contractor shall furnish and apply the material as directed.
- D. Calcium chloride shall be commercial grade, furnished in 100 lb, 5-ply bags, stored under weatherproof cover and stacked alternately for ventilation. Application for dust control shall be at the rate of about 1/2 pound per square yard, unless otherwise directed by the Engineer.
- E. Within buildings, the Contractor shall provide suitable materials and methods of dust control, containment, and clean up during construction. Methods, materials, and schedule shall be approved by the Engineer.

1.13 MAINTENANCE OF TRAFFIC

- A. Unless permission to close a street is received in writing from the proper authority, all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he/she shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.
- B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured the Contractor shall expedite construction operations and periods when traffic is being detoured will be strictly controlled by the Owner.
- C. The Contractor shall take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.
- D. When, in the opinion of the Police Department, public safety requires the services of police, the Safety Officer may direct the Contractor to provide manpower to direct traffic within the location of work under this Contract.

- E. Under normal circumstances the Contractor shall coordinate the scheduling of all police activities. The Contractor shall make all arrangements in obtaining the manpower and all invoices for policing.
- F. The intent is to insure public safety by police direction of traffic. Police are not to serve as watchmen to protect the Contractor's equipment and materials, or to warn pedestrians of such hazards as open trenches.
- G. Nothing contained herein shall be construed as relieving the Contractor of any of his/her responsibilities for protection of persons and property under the terms of the Contract.
- H. Contractor shall furnish and maintain traffic control signage throughout the project and at all construction areas. Signs shall be standard signs in compliance with Massachusetts Highway standards. Signs shall be provided in accordance with the traffic management plans and specifications in the Contract Documents.
- I. It is the intent of this contract that traffic is maintained at all times in the areas of construction. The contractor may be required to halt operations and/or transport material to areas beyond immediate work locations in order to allow minimum traffic disruptions. Access to the site by emergency vehicles, school buses and residents shall be maintained at all times.
- J. The contractor shall be responsible for providing property owners with written notification of proposed construction which may require detours or road closures.
- K. Refer to Section 01850 – Traffic Management for additional requirements.

1.14 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly-constructed work shall be carefully protected from injury in any way. No placing of heavy loads on it shall be allowed, and all portions injured shall be reconstructed by the Contractor at its own expense.
- B. All structures shall be protected in a manner approved by the Engineer. All such damaged portions of the work shall be completely repaired and made good by the Contractor, at his own expense, and to the satisfaction of the Engineer.
- C. If, in the final inspection of the work, any defects, faults, or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship, without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction, and other work undertaken herein, for at least the guarantee period described in the Contract Documents.

CONTROL OF WORK 01046-5

- D. The Contractor shall take all necessary precautions to prevent damage to any work during and after construction, and until such work is accepted and taken over by the Owner.
- E. After the buildings have been made watertight and ready for the installation of pumps, motors, piping and other equipment, the interior temperature shall be maintained at a minimum of 50 degrees F and thereafter, until the completion of the Contract, the temperature shall not be allowed to drop below 50 degrees F.

1.15 CARE AND PROTECTION OF PROPERTY AND SURVEY MONUMENTS

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property, by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in another manner acceptable to the Engineer.
- B. Along the location of this work, all fences, walks, bushes, trees, shrubbery, and other physical features shall be protected and restored in a thoroughly workmanlike manner. Fences and other features removed by the Contractor shall be replaced in the location indicated on the Drawings as soon as conditions permit. All grass areas beyond the limits of construction, which have been damaged by the Contractor, shall be graded and seeded at the Contractor's expense.
- C. Trees close to the work shall be boxed or otherwise protected against injury. The Contractor shall trim all branches that are liable to damage because of his operations, but in no case shall any trees be cut or removed without prior notification of the Owner or other person in charge. All injuries to bark, trunk, limbs, and roots of trees shall be repaired by dressing, cutting, and painting according to approved methods using only approved tools and materials.
- D. The protection, removal, and replacement of existing physical features along the line of work shall be a part of the work under the Contract, and all costs in connection therewith shall be included in the Bid Proposal. The Contractor is responsible for protecting and, if required, re-setting survey monuments (bounds). If a bound is in the way of required excavation, the Contractor will notify the Engineer/Inspector and/or the Town Engineering Division with as much notice as possible prior to performing excavation near the bound.

1.16 REJECTED MATERIALS AND DEFECTIVE WORK

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the Specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work. Any errors, defects, or omissions in the execution of the work or in the materials furnished

CONTROL OF WORK 01046-6

by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor, and in a manner satisfactory to the Engineer. The Contractor shall reimburse the Owner for any expenses, losses, or damages incurred in consequence of any defect, error, omission, or act of the Contractor or his employees, as determined by the Engineer, occurring previous to the final payment.

1.17 COORDINATION WITH LOCAL AGENCIES

- A. The Contractor shall attend a Pre-Construction Meeting to be held at the **Westwood Department of Public Works, 50 Carby Street, Westwood, MA 02090** approximately one week prior to start of work. Town departments who will also be invited to this meeting include Police, Fire, Planning, and Conservation. Electric, gas and phone utility companies may also be invited. The contractor will provide the proposed schedule at that time (see Submittals, Section 1300). Any proposed detours will be reviewed with all parties at the Pre-Construction Meeting. If any additional detours are considered after the Pre-Construction Meeting, the Contractor must first get approval from the Engineer.
- B. The Contractor will immediately notify the utility owner of any utility main breaks. In the case of Owner water, the emergency contact number for the **Department of Public Works** during business hours is **781-320-1070**.
- C. The Contractor will be required to reimburse the Owner for the actual cost of the services of **Department of Public Works** required during other than regular working hours. This includes the cost of the Engineer/ Site Inspectors when inspection is required outside the normal business hours. This cost shall be at the rate of time and one-half of the Inspector's pay rate, to be paid to the Owner by the Contractor.
- D. The Contractor shall notify the **Department of Public Works** at least 72 hours prior to the construction of any public improvement so that the Owner can have an inspector present if work requires inspection. In general, inspection will be required:
 - 1. For Road and Driveway Construction:
 - a. When the subgrade is established,
 - b. While placing gravel,
 - c. When final grade of base course is established, and
 - d. During paving operations.
 - 2. For Water or Sewer Construction:
 - a. While laying pipe, but before backfilling,
 - b. During backfilling operations,
 - c. During paving operations, and
 - d. Pressure and leakage tests.

CONTROL OF WORK
01046-7

- E. The Engineer will have the authority to reject any work or materials that do not constitute approval by the Owner and shall not relieve the Contractor of his obligations to perform the work in accordance with the Plans and Specifications.
- F. If applicable, the Contractor shall maintain pavement as specified in Section 02576 and shall provide the Owner with contact information at which he/she can be contacted when he/she is not at the site. Upon notification by the Owner or the Engineer the Contractor shall promptly make repairs to the construction site as may be necessary.
- G. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, curbing, electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him/her at his/her expense.
- H. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines, gas lines and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- I. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Total Price Bid in the Bid Form.
- J. The Contractor shall coordinate the removal and replacement of traffic loops and signals, if required for the performance of the work, at no additional cost to the Owner.
- K. When applicable, in the opinion of the Engineer, permanent relocation of a utility owned by the Owner is required, he/she may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under Article 11 of the Supplementary Conditions. If relocation of a privately owned utility is required, the Owner will notify the Utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and the Utility and shall have no claim for delay due to such relocation. The Contractor shall notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way. Contractor shall also notify Massachusetts Dig Safe, telephone 811 at least 72 hours prior to start of work.

1.18 WATER FOR CONSTRUCTION PURPOSES

CONTROL OF WORK

01046-8

- A. The Contractor may be allowed to purchase water from the Dedham-Westwood Water District for construction testing and start-up purposes.
- B. The express approval of the Dedham-Westwood Water District shall be obtained before water is used. Water shall be metered as specified by the Division and shall only be operated under the supervision of the Division.
- C. No direct cross connections will be permitted between the public water supply and the new water mains, or any other point where the possibility of backflow of contaminated water exists. All connections to points where there is the possibility of backflow shall be arranged to prevent backflow and shall be approved by the Division's Inspector before they are put into operation.
- D. No separate measurement and payment shall be made for temporary water and all costs shall be incidental to and included with each applicable item.

1.19 MAINTENANCE OF FLOW

- A. The Contractor shall maintain the flow in all watercourses, whether open channels or in pipes, in all sewers and other pipes interfered with in the line of work and convey the flow to a suitable point of discharge so as not to flow upon the work or create a nuisance. In the discharge of water removed from the excavations by pumping or by gravity similar precautions shall be observed.

1.20 COOPERATION WITHIN THIS CONTRACT

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and his/her Subcontractors or trades and shall assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.21 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, the Contractor shall keep the site of his/her operations in as clean and neat a condition as is possible. He/She shall dispose of all residues resulting from the construction work and, at the conclusion of the work, he/she shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his/her subcontractors shall comply with all applicable Federal, State and local laws and regulations

CONTROL OF WORK 01046-9

concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

- C. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the Contractor will be required to remove the fill at his/her own expense and restore the area impacted.
- D. Outdoor burning of rubbish and waste material on the site will not be permitted.
- E. Disposal of volatile fluid wastes (such as mineral spirits, oil, gasoline, or paint thinner) in storm or sanitary sewer systems or into streams or waterways is not permitted.
- F. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

END OF SECTION 01046

CONTROL OF WORK
01046-10

SECTION 01063

MISCELLANEOUS REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Contractor shall conform to all miscellaneous requirements as herein specified.

1.3 INTERFERENCE WITH EXISTING WORKS

- A. The Contractor shall at all times conduct his operations so as not to interfere with existing works. The Contractor shall develop a program, in cooperation with the Engineer and Owner, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations therefrom are expressly permitted. All work of connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand. The Contractor shall make such minor modifications in the work relating to existing structures as may be necessary, without additional compensation.

1.4 SEQUENCE OF WORK

- A. Refer to Drawing Sheet G-1.

1.5 WORK CREWS

- A. No more than one work crew will be allowed on site at any time during the project. Additional work crew will not be allowed without prior written approval from the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

MISCELLANEOUS REQUIREMENTS

01063-1

END OF SECTION 01063

MISCELLANEOUS REQUIREMENTS
01063-2

SECTION 01095

REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.
- C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Engineer, requested by the Engineer, and similar phrases.
- D. Approve: The term approved, when used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulation: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the work.
- F. Furnish: The term furnish means supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install: The term install describes operations at the project site, including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Replace: The term replace means dismantle, remove, and dispose of existing equipment and materials and furnish and install new specified item.
- I. Provide: The term provide means to furnish and install, complete and ready for the intended use.

REFERENCE STANDARDS AND DEFINITIONS

01095-1

1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
 2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such a carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
- J Project Site is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the project is to be built.
- K Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where compliance with two or more standards is specified, and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Engineer for a decision before proceeding.
 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.

REFERENCE STANDARDS AND DEFINITIONS

01095-2

D. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not assured, to be accurate and up-to-date as of date of Contract Documents.

ACI American Concrete Institute
P.O. Box 19150
Detroit, Michigan 48219-0150
Telephone: (313) 532-2600

AI Asphalt Institute
Research Park Drive
P.O. Box 14052
Lexington, Kentucky 40512-4052
Telephone: (606) 288-4960

ANSI American National Standards Institute
11 West 42nd Street
13th Floor
New York, New York 10036
Telephone: (212) 642-3300

ASTM American Society for Testing and Materials
1916 Race Street
Philadelphia, Pennsylvania 19103
Telephone: (215) 299-5400

AWWA American Water Works Association
6666 West Quincy Avenue
Denver, Colorado 80235
Telephone: (303) 794-7711

MSS Manufacturers Standardization Society of
the Valve and Fittings Industry
127 Park Street, N.E.
Vienna, Virginia 22180
Telephone: (703) 281-6613

NAPA National Asphalt Pavement Association

REFERENCE STANDARDS AND DEFINITIONS
01095-3

6811 Kenilworth Avenue
Calvert Building
Suite 620
Riverdale, Maryland 20737
Telephone: (301) 779-4880

NFPA National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169
Telephone: (617)- 770-3000

WSC Water Systems Council
600 South Federal Street
Suite 400
Chicago, Illinois 60605
Telephone: (312) 922-6222

F. Federal Government Agencies: Names and titles of Federal Government standard- or specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or specification-producing agencies of the Federal Government. Names and addresses are subject to change and are believed, but not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CFR Code of Federal Regulations
(available from the Government Printing Office)
North Capitol Street between G and H Streets, N.W.
Washington, D.C. 20402
Telephone: (202) 783-3238
(Material is usually first published in the "Federal Register")

EPA Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
Telephone: (202) 382-2090

NIST National Institute of Standards and Technology
(U.S. Department of Commerce)
Gaithersburg, Maryland 20899
Telephone: (301) 975-2000

OSHA Occupational Safety and Health Administration
(U.S. Department of Labor)
Government Printing Office
Washington, D.C. 20402
Telephone: (202) 523-6091

1.4 GOVERNING REGULATIONS AND AUTHORITIES

REFERENCE STANDARDS AND DEFINITIONS

01095-4

- A. The Engineer has contacted authorities having jurisdiction where necessary to obtain information to prepare Contract Documents. Contact authorities having jurisdiction directly for information and decisions regarding the work.

Town of Westwood, Department of Public Works
Telephone: (781) 326-8661

1.5 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, warranties, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01095

REFERENCE STANDARDS AND DEFINITIONS
01095-5

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REFERENCE STANDARDS AND DEFINITIONS
01095-6

SECTION 01110

ENVIRONMENTAL PROTECTION MEASURES

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The work covered by this Section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. The Contractor shall take sufficient precautions during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens and calcium chloride into the supplies and surface waters of the State.
- D. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- E. These Specifications are intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- F. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Massachusetts Department of Environmental Protection.
- G. The Contractor shall pay particular attention to the drainage, and the sedimentation to limit sediment transport.
- H. Contractor shall be responsible for maintenance of the erosion control structures and devices, and replacing as needed to maintain the required protection and performance.

ENVIRONMENTAL PROTECTION MEASURES

01110-1

1.2 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws, regulations, and orders of conditions concerning environmental pollution control and abatement.

1.3 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his/her authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.4 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer, and incorporate permanent control features into the project at the earliest practicable time.

PART 2 – PRODUCTS

2.1 EROSION CONTROLS

- A. Non-woven Filter Fabric, Silt Socks or Silt Sacks to be used where inserted into existing catch basins to prevent siltation of the existing drainage system, as necessary.
- B. Where silt fence is required, provide the following woven geotextile fabric for silt fence:
 1. Mirafi 100X as manufactured by Mirafi, Pendergrass, GA.
 2. GEOTEX 2130 as manufactured by Propex, Chattanooga, TN.
 3. Or acceptable equivalent product.

ENVIRONMENTAL PROTECTION MEASURES 01110-2

2.2 MATERIALS

- A. Physical Properties of Minimum Average Roll of the woven geotextile fabric for silt fence shall be:

	Property	ASTM Test Method	Units	Value
1.	Grab Strength	D4632	lbs [N]	100 [450](min.)
2.	Permissivity	D4491	sec - 1	0.10 (min.)
3.	Apparent Opening Size	D4751	Sieve #	20-30
4.	Ultraviolet Stability	D4355	%	70 (min.)

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install sedimentation barriers in all locations as directed, surrounding base of all deposits of stored excavated material outside of disturbed area, and where directed by the Engineer.
- B. Install all erosion controls and environmental protection measures in accordance with manufacturer's printed instructions.
- C. Overlap silt fence 18 inches minimum for unsewn lap joint. Overlap fabric 6 inches at seam for sewn joint.
- D. Construct earth berms or diversions to intercept and divert runoff water from critical areas.
- E. Protect catch basins and drainage swales from sedimentation by installing inlet protection under catch basin grating casting as shown on the Drawings.
- F. Do not place excavated soil material adjacent to water-course in manner that will cause it to wash away by high water or runoff.
- G. Prevent damage to vegetation by excessive watering or silt accumulation in the discharge area.
- H. Do not dump spoiled material into any streams, wetlands, surface waters, or unspecified locations.
- I. Prevent indiscriminate, arbitrary, or capricious operation of equipment in streams, wetlands or surface waters.

ENVIRONMENTAL PROTECTION MEASURES 01110-3

- J. Do not pump silt-laden water from trenches or excavations into surface waters, streams, wetlands, or natural or man-made channels leading thereto.
- K. Prevent damage to vegetation adjacent to or outside of construction area limits.
- L. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in streams, wet-lands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.
- M. Do not alter flow line of any stream unless indicated or specified.
- N. Clean and dispose of debris from sedimentation barriers on a weekly basis.
- O. Upon completion of work and upon approval of Engineer, remove and legally dispose of sedimentation barriers and environmental protection measures.

3.2 PROTECTION OF WETLANDS RESOURCE AREAS

- A. Care shall be taken to prevent or reduce to a minimum any disturbance to the adjacent wetlands, drainage ditch, surface water body, storm drain or sewer from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the receiving body shall not be directly returned to the surface water body. Such water will be diverted through a settling basin or filter before being directed into the surface water body.
- B. The Contractor shall not discharge water from dewatering or pipe cleaning or lining operations directly into a wetland, surface water, or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels. All dewatering discharges shall also include energy dissipation to prevent scouring.
- C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action drawing or plan approved by the Massachusetts Department of Environmental Protection. Contractor shall submit two copies (2) of approved contingency drawings or plans to the Engineer.
- D. Equipment refueling operations must take place in a supervised area with appropriate secondary containment measures in place and spill response materials accessible on-site for the duration of construction.

3.3 PROVISIONS FOR CONTROL OF EROSION

- A. Special precautions shall be taken in the use of construction equipment to prevent operations which promote erosion. Erosion control measures, such as siltation basins,

hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented.

- B. Disposal of drainage shall be in an area approved by the Owner. The Contractor shall prevent the flow or seepage of drainage back into the drainage area. Drainage shall not be disposed of until silt and other sedimentary materials have been removed. Particular care shall be taken to prevent the discharge of unsuitable drainage to a water supply or surface water body.
- C. As a minimum, the following shall apply:
 - 1. Silt fence shall be provided at points where drainage from the work site may contain polluting substances. The point of control shall be within the limits of the new construction and shall be contained in such a way as to not allow sediment to pass. Other methods which reduce the sediment content to an equal or greater degree may be used as approved by the Engineer.
 - 2. Drainage leaving the site shall flow to water courses in such a manner to prevent erosion.
- D. Measures for control of erosion must be adequate to assure that turbidity in the receiving water will not be increased more than 10 standard turbidity units (s.t.u.), or as otherwise required by the State or other controlling body, in waters used for public water supply or fish unless limits have been established for the particular water. In surface water used for other purposes, the turbidity must not exceed 25 s.t.u. unless otherwise permitted.

3.4 PROTECTION OF STREAMS

- A. Care shall be taken to prevent, or reduce to a minimum, any damage to any stream from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Such waters will be diverted through a settling basin or filter before being directed into the streams.
- B. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Massachusetts Department of Environmental Protection.

ENVIRONMENTAL PROTECTION MEASURES 01110-5

3.5 PROTECTION OF LAND RESOURCES

- A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of construction, that appears to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment, dumping or other operations, protect such trees by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly before beginning operations near them.
- D. Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition. The Engineer will decide what method of restoration shall be used and whether damaged trees shall be treated and healed or removed and disposed of.
- E. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
- F. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.
- G. The locations of the Contractor's storage, and other construction buildings, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and shall require written approval of the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.
- H. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he/she shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

ENVIRONMENTAL PROTECTION MEASURES

01110-6

1. A layout of all temporary roads, excavations and embankments to be constructed within the work area.
 2. Details of temporary road construction.
 3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
 4. A landscaping drawing showing the proposed restoration of the area. Removal of any trees and shrubs outside the limits of existing clearing area shall be indicated. The drawing shall also indicate location of required guard posts or barriers required to control vehicular traffic passing close to trees and shrubs to be maintained undamaged. The drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.
- I. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as approved by the Engineer.
- J. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.6 PROTECTION OF AIR QUALITY

- A. Burning. The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control. The Contractor will be required to maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded, and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient

competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.7 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.8 NOISE CONTROL

- A. The Contractor shall make every effort to minimize noises caused by his/her operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with State and Federal regulations.
- B. Contractor should note local residences within proximately of the work and shall make all efforts to minimize noise disruptions.
- C. **Construction activities and operating equipment shall not begin before 7:00 A.M.**

END OF SECTION 01110

SECTION 01170

SPECIAL PROVISIONS

PART 1 – GENERAL

1.1 GENERAL OBLIGATIONS OF THE CONTRACTOR

- A. General obligations of the Contractor shall be as set forth in the Contract Documents. Unless special payment is specifically provided in the payment paragraphs of the specifications, all incidental work and expense in connection with the completion of work under the Contract will be considered a subsidiary obligation of the Contractor and all such costs shall be included in the appropriate items in the Bid Form in connection with which the costs are incurred.

1.2 SITE INVESTIGATION

- A. The Contractor shall satisfy himself/herself as to the conditions existing within the project area, the type of equipment required to perform the work, the character, quality and quantity of the subsurface materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Drawings and Specifications. Any failure of the Contractor to acquaint himself/herself with the available information will not relieve him/her from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor on the basis of the information made available by the Owner.

1.3 CONTRACTOR'S EMERGENCY CONTACT AND RESPONSE REQUIREMENT

- A. The Contractor will be required to designate a contact person as well as an emergency response crew who can be notified by the Owner and the Engineer during Contract related emergencies, 7 days a week, 24 hours a day throughout the length of this Contract.
- B. The name of the designated person, a daytime contact telephone number, an evening contact telephone number, and a portable cellular telephone number must be furnished to the Owner at the pre-construction meeting. The Contractor must also provide a mobile cellular telephone that will remain at the construction site during the hours of construction. The phone will be in a location that will allow the Contractor to respond to calls as well as the Owner or Engineer.
- C. The contact person shall be required to respond to any **Westwood Department of Public Works** notification in this regard within one hour of such notice by calling **(781) 326-8661** during normal working hours or the **Westwood Police Department (781) 326-1903** after hours. Upon being advised by the **Westwood Department of Public Works** of the location and nature of the emergency, the Contractor will be required to provide an emergency coordinator or contact at the site within one hour of

SPECIAL PROVISIONS

01170-1

the initial notification and to mobilize the necessary response crew(s) and have them at the site of the emergency within two hours of the initial notification.

- D. The Contractor's failure to comply with the above notification and response requirements shall result in a **one thousand five hundred dollar (\$1,500.00)** fine for each failure to respond as indicted in 1.3.C. In addition the Contractor shall be liable for any and all damages, liabilities and costs which result from his/her failure to respond to any emergency within the designated time periods. The Owner assumes no responsibility or costs for the Contractor's negligence in complying with these requirements. If the subject fine or other liabilities are not paid by the Contractor upon request, it shall be deducted from any payment(s) which may be due the Contractor by the Owner, solely at the discretion of the Owner.
- E. The Contractor shall not use any Owner personnel to fulfill these requirements.
- F. This requirement shall be considered an incidental part of the Contract, no matter how many times the Contractor is alerted during this Contract, and no payment will be made for any costs incurred or associated with the emergency contact and response requirements.

1.4 PUBLIC UTILITIES

- A. The Contractor shall comply with the requirements of the Commonwealth of Massachusetts Statute - Chapter 82, Section 40, for excavations in public and private property. Compliance shall include the following:
 - 1. The Contractor shall notify public utility companies in writing at least 72 hours (excluding Saturdays, Sundays and legal holidays) but not more than 30 days before excavating in areas where underground utility plant (pipes, cables, manholes, etc) exist.
 - 2. The Contractor shall be responsible for providing the Utility Companies with a schedule of his/her activities in areas where the utilities exist.
 - 3. The Contractor shall immediately notify utility companies of any damage to their utilities resulting from construction operations.
 - 4. The express approval of the Owner and the Dedham-Westwood Water District shall be obtained before public water is used. Hydrants shall only be operated under the supervision of the Owner's personnel. The water is to be metered. A meter must be attained by the Dedham-Westwood Water District. The Contractor will be responsible for all associated fees and charges for water use.
- B. The Contractor shall notify DIGSAFE and all others included with the road opening permit at least 72 hours before digging, trenching, blasting, demolishing, boring, backfilling, grading, landscaping or other earth moving operations in any public ways, rights of way and easements.

SPECIAL PROVISIONS 01170-2

1.5 PERMITS

- A. The Contractor shall obtain all necessary permits for proper execution of certain phases of the project. The Contractor shall fill out all forms and furnish all drawings required to obtain the permits. A copy of the approved permit shall be submitted to the Engineer. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.
- B. The Contractor shall obtain the required street opening permits from the Westwood Department of Public Works excavations within the street or sidewalk area. There is no permit fee for each street opening.

1.6 TRAFFIC AT STREET INTERSECTIONS

- A. The Contractor shall consult with the Westwood Police Department to determine requirements for officer details.
- B. The Contractor shall minimize interferences with the normal flow of traffic. The Contractor shall take all actions ordered by the Engineer to minimize the disruption of normal traffic flow.
- C. The Contractor shall note the proximity of the project to local residential areas and all efforts shall be taken to minimize traffic disruptions.

1.7 PAVING REQUIREMENTS

- A. The Contractor shall maintain all trench pavements for the duration of the Contract, and ensure that the roadway has a uniform surface passable for all traffic until final paving is complete.
- B. The project area shall be swept following installation of temporary pavement

1.8 MASSDOT REQUIREMENTS (NOT USED)

1.9 CONSERVATION COMMISSION REQUIREMENTS (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01170

SPECIAL PROVISIONS
01170-3

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SPECIAL PROVISIONS
01170-4

SECTION 01200

PROJECT MEETINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 COORDINATION WITH THE OWNER

- A. As part of this Contract, the Contractor shall coordinate his activities with the Owner. In addition, the Contractor will give the Owner significant notice on any work that may be required to meet the contract schedule.

1.3 PRECONSTRUCTION CONFERENCE

- A. A pre-construction conference will be held between the Contractor, the Engineer, the Owner, and applicable agency representatives to review the Contractor's proposed methods of complying with the requirements of the Contract Documents.
- B. Contractor will be notified of the time, date and place where the pre-construction conference will be held.

1.4 PROGRESS MEETINGS WITH ENGINEER

- A. In addition to other regular project meetings for other purposes (as indicated elsewhere in the Contract Documents), hold general progress meetings twice each month with times coordinated with preparation of payment requests. Meeting dates shall be established by the Engineer. Require every entity then involved in the planning, coordination or performance of work to be properly represented at each meeting. Include (when applicable) consultants, separate contractors (if any), principal subcontractors, suppliers/ manufacturers/fabricators, governing authorities, insurers, special supervisory personnel and others with an interest or expertise in the progress of the work. Review each entity's present and future needs including interface requirements, time, sequence, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, submittals, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule. Determine how behind-time work will be expedited and secure commitments from the entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within the Contract Time. Review everything of significance which could affect the progress of the work.

PROJECT MEETINGS

01200-1

- B. Within seven days after each progress meeting date, the Engineer will forward copies of the minutes-of-the-meeting to the Contractor.
- C. Immediately following each progress meeting where revisions to the Progress Schedule/Critical Path Schedule have been made or recognized (regardless of whether agreed to by each entity represented), revise the Schedule. Reissue revised Schedule within 10 days after meeting. At intervals matching the preparation of payment requests, revise and reissue the Schedule to show actual progress of the work in relation to the latest revision of the Schedule.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01200

PROJECT MEETINGS
01200-2

SECTION 01300

SUBMITTALS

PART 1 – GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings, Product Data, Samples, Construction Photographs, and Construction Schedules. Additional general submission requirements are contained in Article 7 of the General Conditions. Detailed submittal requirements will be specified in the technical specifications sections.
- B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing No. or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.

1.2 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

- 1. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
- 2. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
- 3. The Contractor shall check all subcontractors' shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
- 4. All details on shop drawings submitted for approval shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements; such measurements shall be made and noted on the drawings before being submitted for approval.

SUBMITTALS

01300-1

5. Submittals for equipment specified under Division 2 shall include a listing of all installations where identical or similar equipment has been installed and been in operation for a period of at least one year.

B. Product Data

1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliance's and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the Work.

C. Samples

1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the Work.

1.3 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:

1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data
4. Conformance with the Specifications

- B. Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable

SUBMITTALS
01300-2

approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project Representative a copy of each submittal transmittal sheet for shop drawings, product data and samples at the time of submittal of said drawings, product data and samples to the Engineer.

- C. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his/her responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.
- D. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- E. Project work, materials, fabrication, and installation shall conform to approved shop drawings, applicable samples, and product data.

1.4 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- B. Each submittal, appropriately coded, will be returned within 30 working days following receipt of submittal by the Engineer.
- C. Number of submittals required:
 - 1. Shop Drawings as defined in Paragraph 1.2 A: Five copies.
 - 2. Product Data as defined in Paragraph 1.2 B: Three copies.
 - 3. Samples: Submit the number stated in the respective Specification Sections.
- D. Submittals shall contain:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number.
 - 3. Contractor identification.
 - 4. The names of:

SUBMITTALS 01300-3

- a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the specification section number, page and paragraph(s).
 6. Field dimensions, clearly identified as such.
 7. Relation to adjacent or critical features of the Work or materials.
 8. Applicable standards, such as ASTM or Federal Specification numbers.
 9. Identification of deviations from Contract Documents.
 10. Identification of revisions on resubmittals.
 11. An 8-in x 3-in blank space for Contractor and Engineer stamps.

1.5 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

- A. The review of shop drawings, data, and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:
 1. as permitting any departure from the Contract requirements;
 2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
 3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.
- B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting an exception.
- D. Submittals will be returned to the Contractor under one of the following codes.

SUBMITTALS 01300-4

- Code 1 - "NO EXCEPTION TAKEN" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
- Code 2 - "MAKE CORRECTIONS AS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
- Code 3 - "SUBMIT SPECIFIED ITEM". This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 10 calendar days of the date of the Engineer's transmittal requiring the confirmation.
- Code 4 - "REVISE AND RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and nonconforming items that were noted. Resubmittal is to be received by the Engineer within 10 calendar days of the date of the Engineer's transmittal requiring the resubmittal.
- Code 5 - "REJECTED" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.
- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.
- F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered "Rejected" until resubmitted. The Engineer may, at his/her option, provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- G. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture.

SUBMITTALS
01300-5

- H. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.6 DISTRIBUTION

- A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed 6.

1.7 RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change orders and other modifications to the Contract
 - 5. Reviewed shop drawings, Product Data, and Samples
 - 6. Manufacturer's instruction for assembly, installation, and adjusting
- B. Record information concurrent with construction progress, not less than weekly. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates used.
 - 3. Changes made by Addenda and modifications.
- E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

SUBMITTALS 01300-6

1. Measured horizontal and vertical locations of underground utilities and appurtenances, including fire hydrants, gate valves, and service boxes, referenced to permanent surface structures.
2. Field changes of dimension and detail.
3. Details not on original Contract drawings.

1.8 SCHEDULES

- A. Provide all schedules required by Articles 2, 4 and 11, and elsewhere in the General Conditions.
- B. The Contractor shall submit a progress schedule before starting any work, in accordance with Articles 2 and 4 of the General Conditions. The Contractor shall review the progress schedule with the Engineer periodically. Such review shall be made on a monthly basis or more frequently as required by the Engineer. The progress schedule shall be updated as required by the Engineer.

1.9 “OR EQUAL”

- A. Should the Contractor seek approval of a product other than the brand or brands named in these specifications, it shall furnish written evidence that such product conforms in all respects to the specified requirements, and that it has been used successfully elsewhere under similar conditions. Where the specified requirements involve conformance to recognized codes or standards the Contractor shall furnish evidence of such conformance in the form of test or inspection reports, prepared by a recognized agency, and bearing an authorized signature.
- B. Manufacturers’ standard data and catalog cut sheets will not be considered sufficient in themselves, and the Engineer will not be responsible for seeking further data from the manufacturer, or for otherwise researching the product. Failure to provide complete data will be cause for rejection of the product.
- C. The Contractor shall be responsible for all additional costs including license fees, foundation, piping, and electrical work necessary to accommodate the proposed “or equal” equipment. Items which result in a cost reduction shall be presented and a change order reflecting 65% of the cost savings will be prepared and the contract price modified.

1.10 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

- A. If specifically required in other Sections of these Specifications, the Contractor shall submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

SUBMITTALS 01300-7

1.11 GENERAL PROCEDURES FOR SUBMITTALS

- A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01300

SUBMITTALS
01300-8

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a Professional Engineer registered in the Commonwealth of Massachusetts and that he/she has been employed by (Name of Contractor) _____ to design _____ in accordance with Specification Section _____. The undersigned further certifies that he/she has performed the design of the _____, that said design is in conformance with all applicable local, state and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Owner or the Owner's representative with seven days following written request therefor by the Owner.

P.E. Name

Signature

Address

Contractor's Name

Signature

Title

Address

SUBMITTALS
01300-9

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SUBMITTALS
01300-10

SECTION 01311

CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.
- B. Section 01040 – Project Coordination
- C. Section 01170 – Special Provisions

1.2 SUMMARY

- A. Prepare and submit to Engineer for review projected construction schedules. Update and revise schedules periodically to reflect progress of work.

1.3 FORM OF SCHEDULES

- A. Prepare in form of network analysis system using the Critical Path Method.
- B. Perform data preparation, analysis, charting and updating in accordance with pertinent recommendations contained in current edition of "CPM in Construction" manual of the Associated General Contractors.
- C. The network analysis system shall consist of a detailed network, mathematical analysis and a network diagram.
 - 1. The network diagram shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The basic concept of a network analysis diagram will be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.
 - 2. Detailed network activities shown on the network diagram shall include, in addition to environmental protection and construction activities, the submittal for review of samples and shop drawings, the procurement of critical materials and equipment and their installation and testing.

CONSTRUCTION PROGRESS SCHEDULES 01311-1

3. Related activities shall be grouped on the network. The activities on the critical paths shall be highlighted. The network shall be time scaled using units of approximately one-half inch equals one week or other suitable scale approved by the Engineer. Weekends and holidays shall be indicated. Where slack exists, the activities shall be shown at the earliest time they are scheduled to be accomplished. Sheet size shall be 11" x 17" minimum.
4. The mathematical analysis of the network diagram shall include a tabulation of each activity shown on the detailed network diagram. The following information shall be furnished as a minimum for each activity.
 - a. Preceding and following event numbers.
 - b. Activity description.
 - c. Estimated duration of activities in units of working days (being the best estimate available at time of computation).
 - d. Earliest start date (by calendar date).
 - e. Earliest finish date (by calendar date).
 - f. Scheduled or actual start date (by calendar date).
 - g. Scheduled or actual finish date (by calendar date).
 - h. Latest start date (by calendar date).
 - i. Latest finish date (by calendar date).
 - j. Slack or float.
 - k. Monetary value of activity.
 - l. Responsibility for activity (Prime Contractor, subcontractors, suppliers).
 - m. Manpower required by trade and by total. Graphic representatives will be allowed.
 - n. Equipment required.
5. The mathematical analysis shall list the activities in sorts or groups as follows:
 - a. By the preceding event number from lowest to highest and then in the order of the following event number.
 - b. By the amount of slack, then in order of activity number.
 - c. By responsibility in order of earliest start date.

1.4 REVIEW OF SYSTEM

- A. Participate in a review and evaluation of the proposed network diagrams and analysis by the Engineer. Revisions necessary as a result of this review shall be resubmitted to the Engineer within 10 days after the joint review. Ten days will be allowed for checking and further action by the Engineer. Progress payments will be withheld pending attainment of a mutually acceptable schedule. The mutually acceptable schedule shall then be the schedule to be used by the Contractor for planning, organizing, directing and executing the Work and for reporting progress.

CONSTRUCTION PROGRESS SCHEDULES

01311-2

If the Contractor thereafter desires to make changes in his method of operating and scheduling he shall notify the Engineer in writing stating the reasons for the change. If the Engineer considers these changes to be of a major nature he may require the Contractor to revise and submit, without additional cost to the Owner, all of the affected portion of the network diagram and mathematical analysis to show the effect on the entire project. A change may be considered of a major nature if the time estimated to be required or actually used for an activity or the logic of sequence of activities is varied from the original plan to a degree that there is reasonable doubt as to the effect on the Contract completion date or dates. Changes which effect activities with adequate slack time shall be considered as minor changes, except that an accumulation of minor changes may be considered as a major change when their cumulative effect might affect the Contract completion date.

1.5 UPDATES

- A. Submit at intervals of 30 days a report of the actual construction progress by updating the mathematical analysis. All contract changes, including pending and approved change orders and field orders shall be included in the update schedule. Revisions causing changes in the detailed network shall be noted on the network or a revised issue of the affected portions of the detailed network furnished. The network shall be revised as necessary for the sake of clarity.
- B. The report shall show the activities or portions of activities completed during the reporting period and their total value as basis for the Contractor's periodic request for payment. Coordinate with the schedule of breakdown of lump sum items. The report shall state the percentage of the Work actually completed and schedule as of the report date and the progress along the critical path in terms of days ahead or behind the allowable dates. If the project is behind schedule, progress along other paths with negative slack shall be reported. Percentage of work actually completed will be reviewed by the Engineer. If the Contractor fails to submit the required monthly reports and updates within the time prescribed, the Engineer may withhold approval of progress payment estimates until such time as the Contractor submits the required reports and updates. Three copies of the report shall be submitted for each update.
- C. Simultaneously submit a narrative report with the updated analysis which shall include but not be limited to a description of the problem areas, current and anticipated delaying factors, their impact, and an explanation of corrective actions taken or proposed.

1.6 SUBMITTALS

- A. Within 10 days after execution of the AGREEMENT, submit 3 copies of a preliminary schedule indicating planned operations during first 60 days. Include cost of activities expected to be completed before submission and approval of the complete schedule.

CONSTRUCTION PROGRESS SCHEDULES 01311-3

- B. Within 30 days after execution of the AGREEMENT, submit 3 copies of the complete network analysis system. After review, submit 3 copies of the mutually acceptable system.
- C. Submit 3 copies of monthly reports and updates by the tenth day of the month.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01311

CONSTRUCTION PROGRESS SCHEDULES
01311-4

SECTION 01350

HEALTH AND SAFETY PLAN

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall, prior to the start of work on the site, prepare and submit for review, a site-specific health and safety plan. Work may not proceed at the project site until the Owner and/or Engineer have reviewed and approved the Contractor's health and safety plan. Any delays incurred by the Contractor relating to reviews of the health and safety plan shall be the responsibility of the Contractor and constitute no additional costs or claims to the Owner.
- B. Individuals involved in the excavation of potentially impacted soils shall be properly informed and trained in the recognition and response strategies involved with the hazards posed by these contaminants. The excavation of contaminated soils areas is not anticipated. However, the Contractor shall provide appropriate equipment (e.g., temporary fencing, drums) in the event hazardous materials are spilled or encountered.
- C. The Contractor shall be cognizant of the minimum standards set forth in OSHA 29 CFR 1910.120. The health and safety plan shall include, but not be limited to the following:
 - 1. Identification of Contractor's Site Safety Officer.
 - 2. Identification of Contractor's Designated Field Personnel.
 - 3. Type of Medical Surveillance Program.
 - 4. Identification of Hazard and Risks Associated with Project.
 - 5. Contractor's Standard Operating Procedures including Personnel Training and Field Orientation; Personal Hygiene Requirements & Guidelines; Field Monitoring Requirements of Site Contaminants; Respiratory Protection Training & Requirements; Levels of Protection and Selection of Equipment Procedures; Zone Delineation of the Project Site; Site Security and Entry Control Procedures; Contingency and Emergency Procedures; and Listing of Emergency Contacts.
 - 6. The Contractor must be aware of site specific requirements such as site security during non-working hours, limited work space, and minimizing the effects of soil excavation to adjacent structures.
 - 7. The Contractor shall make available complete sets of personal protective equipment and clothing to the Owner and Engineer for use during site

HEALTH AND SAFETY PLAN

01350-1

inspections by the Owner and Engineer. These shall be supplied and maintained at no cost to the Owner, and shall be returned to the Contractor upon completion of the Work, except for expendable disposal protective clothing. Contractor shall provide a repository for collection of disposable health and safety materials. Collection and disposal of contaminated expendable supplies shall be at cost to the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01350

HEALTH AND SAFETY PLAN
01350-2

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Provide schedule of values covering each bid item.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Schedule of values.
 - a. Revise and resubmit schedule until acceptable to the Engineer.
 - 2. Itemize separate line item cost for work involving each lump sum item.
 - a. Ensure that the sum of the items listed in the schedule of values for each bid item equals the price bid for the respective bid item.
 - b. For "Miscellaneous Items", items such as Bond premium and temporary construction facilities may be listed separately in the schedule, provided amounts can be substantiated.
 - 3. Breakdown installed costs into:
 - a. Delivered cost of product, material, equipment.
 - b. Total installed cost with overhead and profit.
 - (1) Do not list overhead and profit as separate items.
 - (2) An unbalanced schedule of values providing for overpayment on items of work performed first will not be accepted.

SCHEDULE OF VALUES

01370-1

1.4 SEQUENCING AND SCHEDULING

- A. Prepare schedule of values covering each bid item after review of tentative schedule at pre-construction conference, but before submission of first application for payment.
- B. Before submitting any application for payment, obtain the Engineer's approval of the Schedule of Values.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01370

SCHEDULE OF VALUES
01370-2

SECTION 01400

QUALITY ASSURANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section covers Quality Assurance and Control requirements for this Contract.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors and suppliers and for assuring the quality specified in the Technical Specifications is achieved.
- C. Refer to the Article 7 - Contractor's Responsibilities, of the GENERAL CONDITIONS.

1.3 TESTING LABORATORY SERVICES

- A. All tests which require the services of a laboratory to determine compliance with the Contract Documents shall be performed by an independent commercial testing laboratory acceptable to the Engineer. The laboratory must be certified by the Commonwealth of Massachusetts for the parameters tested and required under the project. The laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.
- B. Preliminary Testing Services: Unless otherwise specified, the Contractor shall be responsible for all testing laboratory services in connection with concrete materials and mix designs, the design of asphalt mixtures, gradation tests for structural and embankment fills, backfill materials, and all other tests and engineering data required for the Engineer's review of materials and equipment proposed to be used in the Work. The Contractor shall obtain the Engineer's acceptance of the testing laboratory before having services performed, and shall pay all costs for services.
- C. Quality Control Testing Services: Perform all quality control tests in the field or in the laboratory on concrete, asphalt mixtures, moisture-density (Proctor) and gradation tests on structural and embankment fills, and backfill materials, in-place field density tests on structural and embankment fills, and other materials and equipment, during and after their incorporation in the Work. Field sampling and testing shall be performed in the general manner indicated in the Specifications,

QUALITY ASSURANCE

01400-1

with minimum interference with construction operations. The Engineer shall determine the exact time and location of field sampling and testing, and may require such additional sampling and testing as necessary to determine that materials and equipment conform with data previously furnished by Contractor and with the Contract Documents.

- D. Arrangements for delivery of samples and test specimens to the testing laboratory will be made by the Contractor. The laboratory tests shall be performed within a reasonable time consistent with the specified standards. Furnish a written report of each test to the Engineer.
- E. Contractor shall furnish all sample materials and cooperate in the sampling and field testing activities, interrupting the Work when necessary. When sampling or testing activities are performed in the field, the Contractor shall furnish personnel and facilities to assist in the activities.
- F. The Contractor shall not retain any testing laboratory against which the Owner or the Engineer have reasonable objection, and if at any time during the construction process the services become unacceptable to the Owner, or the Engineer, either the Owner or the Engineer may direct in writing that such services be terminated. The request must be supported with evidence of improper testing or unreasonable delay. If the Engineer determines that sufficient cause exists, the Contractor shall terminate the services and engage a different testing laboratory.
- G. Transmittal of Test Reports: Written reports of testing and engineering data furnished by the Contractor for the Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.
- H. The testing laboratory shall furnish four copies of a written report of each test performed by laboratory personnel in the field or laboratory to the Contractor. Distribution shall be two copies of each test report to the Engineer's Representative, one copy to the Owner, and one copy for the Contractor within three days after each test is completed.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Refer to Article 3 - Contract Documents, Intent, Requirements, Reuse, of the General Conditions.
- B. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer.
- C. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable

QUALITY ASSURANCE 01400-2

standards and Specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. Material and equipment shall not be used by the Contractor for any purpose other than that intended or specified unless such use is authorized by the Engineer.

- D. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.
- E. Where so specified, Contractor shall provide the services of Professional Engineers licensed in the State of Massachusetts in the engineering discipline specified. Qualifications of the Professional Engineer shall be provided upon the Engineer's request. Submittals prepared by the Professional Engineer shall be signed and sealed as specified. Engineering submittals shall include the necessary calculations, design criteria, and professional certification to support the product selection and/or design where so specified.

1.5 OFFSITE INSPECTION

- A. When the Specifications require inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, such services shall be performed by an independent testing laboratory, or inspection organization acceptable to Engineer in conjunction with or by the Engineer.
- B. The Contractor shall give appropriate written notice to the Engineer not less than 30 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.
- C. The inspection organization shall submit a written report to the Contractor who shall provide copies to the Engineer.

1.6 MATERIALS AND EQUIPMENT

- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the Specifications. In cases where the manufacturer's printed instructions are more stringent than the Contract Documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless approved otherwise by the Engineer.

QUALITY ASSURANCE 01400-3

1.7 SHOP AND FIELD TESTING

- A. The Contractor is also responsible for providing the shop and field testing specified in the Technical Specification Sections.
- B. The Contractor and its Subcontractor shall perform inspections, tests, and other services as required by the Contract Documents.
- C. Contractor shall provide twenty one day's notice to the Engineer so that the Engineer may witness Contractor and/or Subcontractors off site and on site tests. The Engineer's witnessing of tests does not relieve the Contractor and/or Subcontractors of their obligation to comply with the requirements of the Contract Documents.

1.8 MANUFACTURER'S FIELD SERVICES

- A. When specified in the Technical Specifications Sections, the Contractor shall arrange for and provide technical representation from manufacturers of respective equipment, items or components. The manufacturer's representative shall be a factory trained service engineer/technician with the type and length of experience specified in the Technical Specifications.
- B. Services Furnished Under This Contract: An experienced, competent, and authorized factory trained service engineer/technician representative of the manufacturer of each item of equipment for which field services are indicated in the Specifications shall visit the site of the Work and inspect, operate, test, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's service representative shall be present when the equipment is placed in operation. The manufacturer's service representative shall revisit the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory to the Engineer.

1.9 CERTIFICATION FORMS AND CERTIFICATES

- A. The Contractor shall be responsible for submitting the certification forms and certificates in conformance with the requirements specified in Section 01300 - Submittals.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 QUALITY CONTROL

- A. Quality control is the responsibility of the Contractor, and the Contractor shall

QUALITY ASSURANCE 01400-4

maintain control over construction and installation processes to assure compliance with specified requirements.

- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, pipe fusing, cable splicing, instrument calibration, surveying) shall be maintained in the Contractor's field office, available for inspection by the Engineer. Copies will be made available to the Engineer upon request.
- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer or Owner to supersede or void that responsibility.

END OF SECTION 01400

QUALITY ASSURANCE
01400-5

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SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 INTERFERENCE WITH AND PROTECTION OF STREETS

- A. Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefore from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefore.
- C. The Contractor shall, at least 24 hours in advance, request approval of the Police, DPW, Fire and School Departments in writing, with a copy to the Engineer, if the closure of a street or road is necessary. Contractor must receive approval from Owner prior to the closure. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

1.3 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer.

TEMPORARY FACILITIES AND CONTROLS

01500-1

1.4 INSTALLATION OF EQUIPMENT

- A. Special care shall be taken to ensure proper alignment to all equipment with particular reference to the pumps and electric drives. The units shall be carefully aligned on their foundations by qualified millwrights after their sole plates have been shimmed to true alignment at the anchor bolts. The anchor bolts shall be set in place and the nuts tightened against the shims. After the foundation alignments have been approved by the Engineer, the bed plates or wing feet of the equipment shall be securely bolted in place. The alignment of equipment shall be further checked after securing to the foundations, and after confirmation of all alignments, the sole plates shall be firmly grouted in place. The Contractor shall be responsible for the exact alignment of equipment with associated piping, and under no circumstances, will "pipe springing" be allowed.
- B. All wedges, shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.

1.5 TEMPORARY UTILITIES

- A. Temporary Light and Power: The Contractor shall at his own expense, provide his own temporary light and power as required for the prosecution and completion of work.
- B. Temporary Heat: The Contractor shall, at his own expense, provide sufficient temporary heat to maintain a minimum temperature of 50 degrees F at all times in all areas designated elsewhere in these documents.
- C. Temporary Telephone: The Contractor shall have installed at his own expense a job telephone for his use and for the use of the Engineer. The Contractor shall pay all phone charges.
- D. Sanitary Provisions: The Contractor shall provide and maintain sanitary accommodations for the use of his employees, as may be necessary to comply with the requirements and regulations of the local and state departments of health.
- E. Maintaining Operation of the Existing Facilities:
 - 1. The Contractor shall be responsible for careful consideration of the construction, scheduling and anticipation of potential interference with existing utilities, operations and structures. The Contractor shall maintain close communications with the Engineer and provide the Engineer with a detailed description of each proposed activity sufficiently in advance of its commencement for review and comments to be made.
 - 2. Temporary facilities which may be required include, but are not limited to, electrical power; lighting; heating; cooling; ventilating; telephone; potable water; fire protection; drainage; sanitary facilities; trench covers; protection of existing

TEMPORARY FACILITIES AND CONTROLS

01500-2

utilities; structures; streams; trees and shrubs; access roads; sewage conveyance; piping.

1.6 ACCESS TO THE WORK

- A. The Contractor shall provide sufficient and proper facilities at all times for inspection of all work under this project in preparation or in progress, by the Owner, the agents and employees of the Owner, by authorized representatives of the State of Massachusetts and the Federal Government and by the Engineers.
- B. The Contractor shall furnish the Engineer or his authorized representative and other personnel mentioned above with such facilities and assistance as are necessary to ascertain performance of the work in accordance with the plans and specifications.

1.7 PRECAUTIONS DURING ADVERSE WEATHER

- A. During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.
- B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01500

TEMPORARY FACILITIES AND CONTROLS
01500-3

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TEMPORARY FACILITIES AND CONTROLS
01500-4

SECTION 01610

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.
- B. Section 01850 – Traffic Management.

1.2 SUMMARY

- A. This section specifies the general requirements for the delivery, handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.3 TRANSPORTATION AND DELIVERY

- A. Transport and handle items in accordance with manufacturer's printed instructions.
- B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
- C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Owner's normal operations, the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.
- F. Provide equipment and personnel to unload all items delivered to the site.
- G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e. Owner, Manufacturers, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

DELIVERY, STORAGE, AND HANDLING 01610-1

1.4 STORAGE AND PROTECTION

- A. Store and protect products in accordance with the manufacturer's printed instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer by him. Instructions shall be carefully followed and a written record of this kept by the Contractor. Arrange storage to permit access for inspection.
- B. Store loose granular materials on solid flat surface in a well-drained area. Prevent mixing with foreign matter.
- C. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulation of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in manner to reduce breakage, cracking and spalling to a minimum.
- D. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere (even though covered by canvas) shall be stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. Building shall be provided with ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01610

DELIVERY, STORAGE, AND HANDLING
01610-2

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Record Documents.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payment, and sum remaining due.
- D. Submit all warranties.
- E. Submit written notice that all subcontractors and suppliers have been paid in full.
- F. Submit written notice showing the disposition of all insurance filings and claims.
- G. Copy of "Statement of Compliance" filed with the Division of Labor and Workforce Development, as required under the State Wage Rate Provisions.

CONTRACT CLOSEOUT

01700-1

1.4 RECORD DOCUMENTS

- A. Maintain on site, one set of the following documents; actual revisions to the Work shall be recorded in these documents:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change orders and other Modifications to the Contract
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Written interpretations and clarifications.
 - 7. Field orders.
 - 8. Field test reports properly verified.
 - 9. Upon completion of the project Record Drawings shall be submitted to the Engineer.
- B. Store As-built Documents separate from documents used for construction.
- C. Record information concurrent with construction progress.
- D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name, address and telephone number and product model and serial number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and Modifications.
- E. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical location of excavation limits referenced to permanent surface bounds.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

CONTRACT CLOSEOUT
01700-2

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension of detail.
5. Details not on original Contract Drawings.

1.5 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 1. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

1.6 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01700

CONTRACT CLOSEOUT
01700-3

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CONTRACT CLOSEOUT
01700-4

SECTION 01710

CLEANING UP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. During its progress, the work and the adjacent areas affected thereby shall be cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.
- C. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- D. The Contractor shall thoroughly clean all materials and equipment installed by him and his sub-contractors, and on completion of the work shall deliver it undamaged and in fresh and new-appearing condition. All mechanical equipment shall be left fully charged with lubricant and ready for operation.
- E. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

CLEANING UP 01710-1

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01710

CLEANING UP
01710-2

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS and other DIVISION 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1.3 RELATED WORK

- A. Refer to General Conditions of the Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 - Contract Closeout.
- C. Specific requirements for warranties for the Work and products and installations that are specified to be under warranty are included in the individual Sections of Division 2, inclusive.
- D. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

1.4 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement data for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document

WARRANTIES AND BONDS

01740-1

that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Engineer for approval prior to final execution.

- D. Refer to individual Sections of Divisions 2 for specific content requirements, and particular requirements for submittal of special warranties.
- E. At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the "Warranties and Bonds" binder.
- F. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-in. by 11-in. paper.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the "Warranties and Bonds" binder, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.
- H. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer, supplier, and manufacturer.
- I. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name, address, and telephone numbers of the Contractor and equipment supplier.
- J. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.5 WARRANTY REQUIREMENT

- A. Related Damages and Losses: When correcting Work under warranty that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of Work under warranty.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding; reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or

WARRANTIES AND BONDS

01740-2

rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.6 DEFINITION

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION 01740

WARRANTIES AND BONDS
01740-3

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WARRANTIES AND BONDS
01740-4

DIVISION 2 - SITE WORK

<u>Section</u>	<u>Title</u>	<u>Page</u>
02020	Erosion and Sediment Control	02020-1
02101	Site Investigation	02101-1
02140	Dewatering and Drainage	02140-1
02160	Temporary Excavation Support Systems	02160-1
02200	Earthwork	02200-1
02212	Rock Excavation	02212-1
02538	Temporary By-Pass Pumping	02538-1
02570	Sewers, Manholes and Appurtenances	02570-1
02576	Pavement Repair and Resurfacing	02576-1
02901	Miscellaneous Work and Cleanup	02901-1
02920	Topsoil	02920-1
02945	Turf	02945-1

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SECTION 02020

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles specified herein.

1.2 RELATED SECTIONS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 01110 – Environmental Protection Measures
 - 2. Section 02140 – Dewatering and Drainage
 - 3. Section 02200 – Earthwork

1.3 SUBMITTALS

- A. Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:
 - 1. List of proposed materials including manufacturer’s product data.
 - 2. Perimeter (Limit of Work) Erosion Controls damaged during construction shall be replaced immediately. Schedule of any additional erosion control program indicating specific dates for implementing programs in each major area of work, including dewatering sedimentation basin(s) shall be submitted prior to installation.

- B. The following samples shall be submitted:

<u>Sample</u>	<u>Size</u>
Filter Fabric	12 X 12 in. (Woven and Non-woven)

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
1. Massachusetts Department of Transportation: Construction Standards.
 2. 310 CMR 10.00: Wetlands Protection Act Regulations
 3. Massachusetts Department of Environmental Protection: Erosion and Sediment Control Guidelines for Urban and Suburban Areas.

1.5 EROSION CONTROL PRINCIPLES

A. Erosion Control Principles

The following erosion control principles shall apply to the land grading and construction phases:

1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.
2. Whenever feasible, natural vegetation shall be retained and protected.
3. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.
4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance. Prolonged exposure of unstabilized soil shall not exceed 60 days.
5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
6. Sediment shall be retained on-site.
7. Truck wheel wash station shall be properly maintained during work. Dewatering sedimentation basin(s) shall be installed prior to dewatering operations.

B. Erosion Protection

Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to two (2) months, and temporary erosion protection when erosion exposure period is expected to be less than two (2) months.

EROSION AND SEDIMENT CONTROL 02020-2

1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.
2. Temporary erosion protection shall be accomplished by covering with an erosion protection material, as appropriate for prevailing conditions.
3. Except where specified, fill slopes shall be limited to a grade of 3:1 (horizontal: vertical); cut slopes shall be limited to a grade of 2:1.

PART 2 - PRODUCTS

2.1 FILTER SOCK

- A. Filter sock for construction of erosion control devices shall be blown or placed media (mulch or compost) in twelve-inch diameter biodegradable filter sock.
- B. Wooden stakes (2-inches by 2-inches by 36-inches) shall be placed 10 feet on center, driven a minimum of 12-inches into the ground.

2.2 HAY BALES

- A. Hay bales for construction of erosion control devices shall be new, firm, salt marsh hay bound with biodegradable twine.

2.3 TEMPORARY SEED COVER

- A. If required, seed mixture for temporary cover by hydroseeding application shall conform to the following:

<u>Quantity per 1,000 sq. ft. Coverage</u>	<u>Material</u>
27-1/2 lb.	Wood Fiber Mulch
4 lb.	Seed
1/2 lb.	Annual Ryegrass
22 lb.	10-6-4 Fertilizer
69 gal.	Water

- B. Hydroseeding Equipment:

Hydroseeding equipment may be either portable or truck mounted, with dual agitation, a minimum working volume of 1,000 gallons and a minimum spray range of eighty (80) feet.

1. Hydroseeding equipment must be capable of uniformly applying the slurry

mix including wood fiber mulch if required, at the specified rate, and at the required locations.

2. Hydromulching equipment, either trailer or truck mounted, must be capable of uniformly applying straw or hay mulch at a minimum mulching rate of eight (8) tons per hour, at a distance of not less than eighty (80) feet.

2.4 DEWATERING (SILT) BAGS

- A. Silt bags shall be utilized for trench dewatering activities.

2.5 SEDIMENTATION CONTROL AT CATCHBASINS

- A. Silt sacks (or approved equal) shall be utilized at each catch basin for sedimentation control.

2.6 SILT FENCE

- A. Where silt fence is required, provide the following woven geotextile fabric for silt fence:

1. Mirafi 100X as manufactured by Mirafi, Pendergrass, GA.
2. GEOTEX 2130 as manufactured by Propex, Chattanooga, TN.
3. Or acceptable equivalent product.

- B. Physical Properties of Minimum Average Roll of the woven geotextile fabric for silt fence shall be:

	Property	ASTM Test Method	Units	Value
1.	Grab Strength	D4632	lbs [N]	100 [450](min.)
2.	Permissivity	D4491	sec - 1	0.10 (min.)
3.	Apparent Opening Size	D4751	Sieve #	20-30
4.	Ultraviolet Stability	D4355	%	70 (min.)

PART 3 - EXECUTION

3.1 HYDROSEEDING

- A. If required for long-term disturbance greater than 60 days, seed for temporary cover shall be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, fertilizer, mulch and water shall be mixed and applied to achieve application quantities specified. Material shall be applied in 2 equal applications, with the equipment during the second pass moving perpendicular to direction employed during the first pass. Hydroseeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.

EROSION AND SEDIMENT CONTROL
02020-4

- B. If the results of hydroseeding application are unsatisfactory in the opinion of the Engineer, the mixture and/or application rate and methods shall be modified to achieve the required results.
- C. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas seeded repeatedly until all areas are covered with a satisfactory growth of grass as determined by the Engineer.

3.2 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

- A. Wetland area, water courses, and drainage swales adjacent to construction activities shall be monitored continuously for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.
- B. Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.
- C. Maintenance of Erosion Control Devices
 - 1. Sediment behind the erosion control device shall be checked at least weekly and after heavy rain. Silt shall be removed if greater than 6 inches deep.
 - 2. Condition of erosion control devices shall be checked at least weekly and after heavy rain. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.
 - 3. Filter socks, silts sacks, hay bales, and other erosion control devices shall be inspected at least weekly and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of perimeter controls shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath controls.
 - 4. Sediment deposits shall be properly disposed of, in a location and manner which will not cause sediment nuisance elsewhere.
- D. Removal of Erosion Control Devices
 - 1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
 - 2. Erosion protection material shall be kept securely anchored until acceptance of the entire Project.

EROSION AND SEDIMENT CONTROL 02020-5

END OF SECTION 02020

EROSION AND SEDIMENT CONTROL
02020-6

SECTION 02101

SITE INVESTIGATION

PART 1 – GENERAL

1.1 SITE CONDITIONS

- A. The Contractor acknowledges that he/she has satisfied him/herself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling, and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, groundwater table or similar physical conditions at the site, the conformation of subsurface materials to be encountered, the character of equipment and facilities needed prior to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this Contract. Any failure by the Contractor to acquaint him/herself with all available information concerning these conditions will not relieve him/her from responsibility for estimating properly the difficulty or cost of successfully performing the work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 02101

SITE INVESTIGATION
02101-1

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SITE INVESTIGATION
02101-2

SECTION 02140

DEWATERING AND DRAINAGE

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Furnish, install, operate, monitor, maintain, and remove temporary dewatering and drainage systems as necessary to lower and maintain groundwater levels below subgrades of excavations and prevent surface water runoff from entering or accumulating in excavations, to permit construction in the dry.
- B. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with local requirements and permits.
- C. Repair any damage caused by dewatering and drainage system operations.
- D. Remove temporary dewatering and drainage systems when no longer needed, and restore all disturbed areas.

1.2 RELATED WORK

- A. Section 01110 – Environmental Protection Measure
- B. Section 02020 – Erosion and Sediment Control
- C. Section 02200 – Earthwork

1.3 SUBMITTALS

- A. Submit the proposed temporary dewatering and drainage system designs. Contractor shall remain responsible for adequacy and safety of construction means, methods, and techniques.

1.4 DEFINITIONS

- A. Where the phrase "in-the-dry" is used in these specifications, it shall be defined as soil conditions that are no more than two percentage points above the optimum moisture content for that soil.

1.5 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. Employ the services of a dewatering specialist or firm having the following

DEWATERING AND DRAINAGE 02140-1

qualifications:

1. Have completed at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years.
 2. Retain the services of a Registered Professional Engineer (in the state where the project is located) having a minimum of five (5) years' experience in the design of well points, deep wells, recharge systems, or equal systems.
 3. Retain the services of a field representative having a minimum of 5 years' experience in installation of well points, deep wells, recharge systems, or equal systems.
- B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.
- C. Notify the Engineer immediately if any settlement or movement is detected on structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.
- D. If oil and/or other hazardous materials are encountered after dewatering begins, immediately notify the Engineer.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Piping, pumping equipment and all other materials required to dewater excavations shall be suitable for the intended purpose. Standby pumping units shall be maintained at the site to be used in case of failure of the normal pumping units. Do not excavate until the dewatering system is operational
- B. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, a minimum of one (1) working auxiliary pump is required, and an additional one (1) pump for every five (5) used.
- C. Provide and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.
- D. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.
- E. Provide cement grout having a water cement ratio of 1 to 1 by volume.

DEWATERING AND DRAINAGE 02140-2

PART 3 – EXECUTION

3.1 GENERAL

- A. Surface water and groundwater shall be controlled such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed and softening or instability of, or disturbance to, the subgrade due to the presence or seepage of water does not occur.
- B. All work shall be protected from flotation.
- C. The impact of anticipated subsurface soil/water conditions shall be factored into the selection of methods of excavation and proposed dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, it is expected that some type of pumped dewatering system will be required for pre-drainage of the soils prior to excavation to final grade and for maintaining the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. It is further expected that the type of system, spacing of dewatering units, and other details of the work will vary depending on soil/water conditions at a particular location.

3.2 SURFACE WATER CONTROL

- A. Surface water control measures shall be constructed to prevent flow of surface waters into excavations. Such measures may include dikes, ditches, and sumps.

3.3 EXCAVATION DEWATERING

- A. Provide and maintain adequate equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept in-the-dry, so as to maintain an undisturbed subgrade condition throughout construction below grade, including backfill and fill placement.
- B. Water entering excavations from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sump, and pumped from the excavation to maintain in-the-dry conditions.
- C. Pipe and conduit shall not be laid in water or allowed to be submerged prior to backfilling. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.
- D. Excavations for foundations and structures shall be maintained in-the-dry for a minimum of four days after concrete placement. In no event shall water be allowed to enter an excavation and rise to cause unbalanced pressure on foundations and structures until the concrete or mortar has set at least 24 hours.

DEWATERING AND DRAINAGE 02140-3

- E. Dewatering and drainage operations shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, the unsuitable subgrade material shall be removed and replaced with concrete, compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its natural undisturbed condition.
- F. Dewatering and drainage operations shall be conducted in a manner which does not cause loss of ground or disturbance to the pipe bedding or soil which supports overlying or adjacent structures.

3.4 DISPOSAL OF DRAINAGE

- A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with approved sedimentation and control plans and methods. Sanitary sewer systems or private on-site septic systems shall not be used to dispose of drainage.

END OF SECTION 02140

DEWATERING AND DRAINAGE 02140-4

SECTION 02160

TEMPORARY EXCAVATION SUPPORT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
1. Design, furnish and install temporary excavation support systems as required to maintain lateral support, prevent loss of ground, limit soil movements to acceptable limits and protect from damage existing and proposed improvements including, but not limited to, pipelines, utilities, structures, roadways, and other facilities.
 2. Common types of excavation support system include, but are not limited to: singular or multiple stages comprised of cantilevered or internally braced soldier piles and lagging, steel sheetpile wall, timber sheetpile wall, trench box, or combinations thereof. Trench box temporary excavation support system is only acceptable for pipe or utility trench excavations. Temporary unsupported open cut excavation with stable sloping sides is allowed where applicable.
 3. Wherever the word "sheeting" is used in this section or on the contract drawings, it shall be in reference to any type of excavation support system specified except trench box.
 4. Construction of the temporary excavation support systems shall not disturb the existing structures or the completed proposed structures. Damage to such structures shall be repaired by the Contractor at no additional cost to the Owner.
 5. The Contractor shall bear the entire cost and responsibility of correcting any failure, damages, subsidence, upheaval or cave-ins as a result of improper installation, maintenance or design of the temporary excavation support systems. The Contractor shall pay for all claims, costs and damages that arise as a result of the work performed at no additional cost to the Owner.

1.2 RELATED SECTIONS

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

TEMPORARY EXCAVATION SUPPORT SYSTEMS 02160-1

1. Section 02140 – Dewatering and Drainage
2. Section 02200 – Earthwork
3. Section 03300 – Cast-in-Place Concrete

1.3 SUBMITTALS

A. Shop Drawing: Submit the following in accordance with Section 01300 - SUBMITTALS:

1. Submit the following qualifications four (4) weeks prior to the construction:
 - a. Qualifications of Contractor's temporary excavation support system designer as specified in Paragraph 1.4 D.
 - b. Qualifications of Contractor's temporary excavation support system installer as specified in Paragraph 1.4 E.
 - c. Qualifications of Contractor's independent tieback testing laboratory as specified in Paragraph 1.4 F, if a tieback system is utilized.
 - d. Qualifications of Contractor's temporary excavation support system installation supervisor as specified in Paragraph 1.4 G.
2. Submit a temporary excavation support plan stamped and signed by a Massachusetts Registered Professional Engineer at least two weeks prior to start of the construction. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
 - a. Proposed temporary excavation support system(s), details, location, layout, depths, extent of different types of support relative to existing features and the permanent structures to be constructed, and methods and sequence of installation and removal.
 - b. If utilizing a tieback system, include tieback installation procedures and criteria for acceptance of tiebacks for performance and proof tests. Submit the tieback testing results to the Engineer for information only.

TEMPORARY EXCAVATION SUPPORT SYSTEMS 02160-2

- c. Requirements of dewatering during the construction, per Section 02140.
 - d. Minimum lateral distance from the edge of the excavation support system for use for vehicles, construction equipment, and stockpiled construction and excavated materials.
 - e. List of equipment used for installing the excavation support systems.
3. Submit a Construction Contingency Plan specifying the methods and procedures to maintain temporary excavation support system stability if the allowable movement of the adjacent ground and adjacent structures is exceeded.
4. For excavation support systems left in place, submit the following as-built information prior to backfilling and covering the excavation support systems:
 - a. Survey locations of the temporary excavation support systems, including coordinates of the ends and points of change in direction.
 - b. Type of the temporary excavation support system.
 - c. Elevations of top and bottom of the excavation support systems left in place.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. Conform to the requirements of the OSHA Standards and Interpretations: "Part 1926 Subpart P - Excavation, Trenching, and Shoring", and all other applicable laws, regulations, rules, and codes.
- C. All welding shall be performed in accordance with AWS D1.1.
- D. Prepare design, including calculations and drawings, under the direction of a Professional Engineer registered in Massachusetts and having the following qualifications:
 1. Not less than ten (10) years' experience in the design of specific temporary excavation support systems to be used.
 2. Completed not less than five (5) successful temporary excavation support system projects of equal type, size, and complexity within the last five (5) years.

TEMPORARY EXCAVATION SUPPORT SYSTEMS 02160-3

- E. Temporary Excavation Support System Installer's Qualifications:
 - 1. Not less than three (3) years' experience in the installation of similar types and equal complexity as the proposed system.
 - 2. Completed not less than three (3) successful excavation support systems of similar type and equal complexity as the proposed system.

- F. If utilizing a tieback system, employ an independent testing laboratory to test the tieback system with the following qualifications:
 - 1. Be accredited by the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program.
 - 2. Employ personnel conducting testing who are trained in the methods and procedures to test and monitor tieback systems of similar type and equal complexity, as the proposed system.
 - 3. Have not less than five (5) years' experience in testing of tieback systems of similar type and equal complexity as the proposed system.
 - 4. Have successfully tested at least three (3) tieback systems of similar type and equal complexity as the proposed system.

- G. Install all temporary excavation support systems under the supervision of a supervisor having the following qualifications:
 - 1. Not less than five (5) years' experience in installation of systems of similar type and equal complexity as the proposed system.
 - 2. Completed at least five (5) successful temporary excavation support systems of similar type and equal complexity as the proposed system.

1.5 DESIGN CRITERIA

- A. Design of temporary excavation support systems shall meet the following minimum requirements:
 - 1. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, temporary stockpiles, construction loads, and other surcharge loads.
 - 2. Design a bracing system to provide sufficient reaction to maintain stability.
 - 3. Limit movement of ground adjacent to the excavation support system to be within the allowable ground deformation as specified.

TEMPORARY EXCAVATION SUPPORT SYSTEMS 02160-4

4. Design the embedment depth below bottom of excavation to minimize lateral and vertical earth movements and provide bottom stability. Toe of braced temporary excavation support systems shall not be less than 5 feet below the bottom of the excavation.
5. Design temporary excavation support systems to withstand an additional 2 feet of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.
6. Maximum width of pipe trench excavation shall be as indicated on the drawings.
7. Do not cast permanent structure walls directly against excavation support walls.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store sheeting and bracing materials to prevent sagging which would produce permanent deformation. Keep concentrated loads which occur during stacking or lifting below the level which would produce permanent deformation of the material.

1.7 PROJECT/SITE CONDITIONS

- A. Subsurface Conditions: Refer to the Contract Document for available information.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel: All soldier piles, wales, rakers, struts, wedges, plates, waterstop and accessory steel shapes shall conform to ASTM A36.
- B. Steel Sheet Piling: ASTM A328, continuous interlocking Z-type. Steel sheet shall be ASTM A572 Grade 60.
- C. Timber Lagging Left in Place: Pressured treated per appropriate AWWA standards.
- D. Tieback Tendons: Tieback tendons shall be high strength steel wire strand cables conforming to ASTM A416, or bars conforming to ASTM A722. Splicing of individual cables shall not be permitted.
- E. Raker Ties: ASTM A615 Grade 60.
- F. Cement Grout Materials and Admixtures for Tieback Anchorages: Grout cube strength shall be a minimum 3500 psi at 7 days and 5000 psi at 28 days.

TEMPORARY EXCAVATION SUPPORT SYSTEMS 02160-5

- G. Concrete: Refer to Section 03300.
- H. Tamping tools adapted for backfilling voids after removal of the excavation support system.
- I. Provide specific trench box sizes for each pipe and utility excavation with structural capacity of retaining soil types as described in OSHA's 29 CFR Part 1926 Subpart P.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of the temporary excavation support systems shall not commence until the related earth excavation and dewatering submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed.
- B. Install excavation support systems in accordance with the temporary excavation support plan.
- C. If utilizing a tieback system, all performance and proof tests shall be conducted in the presence of the Engineer. Testing performed without the Engineer present will not be accepted. Repeat testing in the Engineer's presence at no additional cost to the Owner.
- D. Do not drive sheeting within 100 feet of concrete less than seven (7) days old.
- E. Carry out program of temporary excavation support in such a manner as to prevent undermining or disturbing foundations of existing structures of work ongoing or previously completed.
- F. Bottom of the trench box excavation support system shall be above the pipe invert prior to installing the pipe.
- G. Install and survey geotechnical instrumentation in accordance with the temporary excavation support plan. Notify the Engineer immediately if any geotechnical instrumentation is damaged. Repair or replace damaged geotechnical instrumentation at the sole option of the Engineer and at no additional cost to the Owner.
- H. Continuously monitor movements of the ground adjacent to excavation support systems and adjacent structures. In event of the measured movements approaching or exceeding the allowable movements, take immediate steps to arrest further movement by revising procedures such as providing supplementary bracing, filling voids behind the trench box, supporting utilities or other measures (Construction

TEMPORARY EXCAVATION SUPPORT SYSTEMS

02160-6

Contingency Plan) as required.

- I. Notify utility owners if existing utilities interfere with the temporary excavation support system. Modify the existing utility with the utility owner's permission or have the utility owner make the modifications at no additional cost to Owner.

3.2 GROUND DEFORMATION ADJACENT TO EXCAVATION SUPPORT SYSTEMS

- A. Criteria for "threshold" and "limiting" movements of wall elements of excavation support system have been established as follows:

1. "Threshold" Horizontal Movement:

Dx = No greater than 1.25 inch where no buildings are present within 25 ft. of support system

Dx = No greater than 0.5 inch where buildings are present within 25 ft. of support system.

Where

Dx = measured horizontal wall movement at any level.

2. "Limiting" Horizontal Movement:

Dx = No greater than 2.0 inches where no buildings are present within 25 ft. of support system

Dx = No greater than 0.75 inch where buildings are present within 25 ft. of support system.

- B. The Contractor shall notify the Engineer and shall take immediate steps to control further movement by revising his procedures, providing supplemental bracing or other measures (working 24 hours per day or temporarily terminating work in the area of movement if necessary) as required if any of the following occur:

1. Field measurements indicate that any of the "threshold" movement criteria are reached or exceeded.
2. Field measurements or observations indicate that significant or sustained wall movements are occurring (total movement may be less than the "Limiting" movement criteria).
3. Movements of adjacent structures, utilities or other facilities are detected.

- C. If "Limiting" movements are being approached or reached, the Engineer, based on his judgment and review of the movement monitoring data, may require the Contractor to temporarily terminate the work in the area where such movement is

TEMPORARY EXCAVATION SUPPORT SYSTEMS

02160-7

occurring and implement all necessary mitigation measures which are satisfactory to the Engineer, to arrest the movements, at no cost to the Owner.

- D. Horizontal or vertical movement of any point on adjacent structures shall not exceed 0.5 inches. The Contractor shall establish and monitor survey points on the adjacent structures. The Contractor shall take all necessary measures to prevent greater settlements, at no additional cost to the Owner.
- E. These criteria are intended to establish a minimum basis for the Contractor's design and procedures and in no way relieve the Contractor of his sole responsibility for preventing detrimental movements and damage to adjacent structures, utilities or other work.
- F. Monitoring personnel shall use a procedure for reading and recording geotechnical instrumentation data which compares the current reading to the last reading during data collection to eliminate spurious readings.
- G. Plot the observed ground deformation readings versus time. Annotate the plots with construction loading and excavation events having an impact on the readings. Evaluate plots by means of secondary rate-of-change plots to provide early warning of accelerating ground movements.
- H. Implement Construction Contingency Plan under direction of the temporary excavation support system designer, installation supervisor and the Engineer.

3.3 REMOVAL OF EARTH RETENTION SYSTEM

- A. Sheet piling shall not be left in place unless otherwise indicated or approved in writing by the Engineer.
- B. When indicated or approved by the Engineer, remove the temporary excavation support system without endangering the constructed or adjacent structures, utilities, or property. Immediately backfill all voids left or caused by withdrawal of temporary excavation support systems with bank-run gravel, screened gravel or select borrow by tamping with tools specifically adapted for that purpose.
- C. When tiebacks are used, release tension in tiebacks as the excavation is backfilled. Do not leave tensioned tieback in place at the completion of the work.
- D. The excavation support system left-in-place shall be cut-off a minimum of 2 feet below the bottom of the next higher foundation level or a minimum of 5 feet below finished grade.
- E. Conduct survey of the locations and final cut-off elevations of the excavation support systems left in place.
- F. Submit as-built information, prior to backfilling.

TEMPORARY EXCAVATION SUPPORT SYSTEMS

02160-8

3.4 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02160

TEMPORARY EXCAVATION SUPPORT SYSTEMS
02160-9

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TEMPORARY EXCAVATION SUPPORT SYSTEMS
02160-10

SECTION 02200

EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes excavations of normal depth in earth for trenches and structures; backfilling such excavations to the extent required; filling; rough grading; miscellaneous earth excavation; temporary excavation support; the removal, hauling and stockpiling of suitable excavated material for subsequent use in the work; all rehandling, hauling and placing of stockpiled materials for use in refilling, filling, backfilling, grading and such other operations; the removal and satisfactory disposal off the site of unsuitable material; compaction; and appurtenant work, complete, in accordance with the Drawings and Specifications, and as directed.
- B. Related Sections includes the following:
 - 1. Section 02140 – Dewatering and Drainage
 - 2. Section 02160 – Temporary Excavation Support Systems
 - 3. Section 02212 – Rock Excavation
 - 4. Section 02576 – Pavement Repair and Resurfacing

1.2 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Backfill Materials: If requested by the Engineer, the Contractor shall pay for and submit a grain size analysis and curve performed in accordance with ASTM D422 for each proposed source of backfill for review by the Engineer. The grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
- C. If requested by the Engineer, submit a controlled density fill (CDF) mix design showing the proportions and gradations of all materials.
- D. If requested by the Engineer, submit a moisture-density curve indicating the maximum dry-density and optimum moisture content as determined by ASTM D1557 for each proposed source of backfill for review by the Engineer.
- E. Submit the qualifications of the independent geotechnical testing laboratory performing soil testing and inspection services during earthwork operations. The

EARTHWORK 02200-1

geotechnical testing laboratory must demonstrate to the Engineer's satisfaction, based on evaluation of laboratory submitted criteria conforming to ASTM D3740, that it has the experience and capability to conduct required field and laboratory geotechnical testing. In addition, the laboratory shall be supervised by a Registered Professional Engineer in the State of Massachusetts.

- F. Submit an excavation, backfilling, and filling plan at least one week prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:
1. Detailed sequence of work.
 2. General description of construction methods.
 3. Numbers, types, and sizes of equipment proposed to perform excavation and compaction.
 4. Details of dust control measures.
 5. Proposed locations of stockpiled excavation and/or backfill materials.
 6. Proposed surplus excavated material off-site disposal areas and required permits.

1.3 EXCAVATION CLASSIFICATIONS

- A. Earth Excavation or "Excavation" consists of removal of materials encountered to the subgrade elevations indicated and subsequent reuse or disposal of the materials removed. All excavation is classified as earth excavation unless it otherwise meets the classifications provided below for exploratory excavation, unauthorized excavation, additional excavation, or rock excavation.
- B. Exploratory Excavation, also referred to as test pits, shall consist of the removal of materials for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work. Exploratory excavation shall be performed as shown on the plans and as directed by the Engineer. Exploratory excavation shall be paid for under the unit cost pay item. Exploratory excavation not directed or approved by the Engineer shall be at the Contractor's expense.
- C. Unauthorized Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at Contractor's expense.

EARTHWORK 02200-2

D. Additional Excavation:

1. When excavation has reached required subgrade elevations, notify the Engineer who will review subgrade conditions.
2. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Engineer.
3. Removal of unsuitable material and its replacement as directed will be paid on the basis of contract conditions relative to changes in work or as provided for under the unit rates for this classification.

E. Rock Excavation:

1. Determination of rock excavation classification will be made by the Engineer as specified in Section 02212 – Rock Excavation.

1.4 EXCAVATION

- A. The Contractor shall perform all excavations of every description and of whatever substances encountered, in a manner as required to allow for placing of temporary earth support, forms, installation of pipe and other work, and to permit access to the Engineer for the purpose of observing the work. Excavations shall be to such widths as will give suitable space for the required work. Bottoms of trenches and excavations shall be protected from frost and shall be firm, dry and in an acceptable condition to receive the work; work shall not be placed on frozen surfaces nor shall work be placed on wet or unstable surfaces.
- B. All excavations made in open cut will be controlled by the conditions existing at the various locations and shall always be confined to the limits as designated by the Engineer. In no case shall earth be excavated or disturbed by machinery so near to the finished subgrade for structures and pipelines as to result in the disturbance of the earth below the subgrade. The final excavation to subgrade should be accomplished with a smooth faced bucket or by hand if directed by the Engineer.
- C. The Contractor shall satisfy all dewatering requirements specified in Section 02140 – Dewatering and Drainage, before performing trench excavations.

1.5 TEMPORARY EARTH SUPPORT

- A. The Contractor shall furnish, place and maintain such sheeting, shoring, and bracing at locations necessary to support the sides of excavations and to prevent danger to persons or damage to pavements, facilities, utilities, or structures, and to prevent injurious caving or erosion or the loss of ground, and to maintain pedestrian and vehicular traffic as directed and required in accordance with Section 02160 - Temporary Excavation Support Systems.

EARTHWORK 02200-3

PART 2 – PRODUCTS

2.1 BACKFILL MATERIALS

- A. Common Fill. Common fill (structural fill, gravel borrow, or backfill) shall consist of inert material that is hard, durable stone and coarse sand free from frost, frozen lumps, loam and clay, surface coatings, and deleterious materials.

Graduation requirements for gravel shall be determined by AASHTO-T11 and T27 and shall conform to the following:

<u>Sieve Designation</u>	<u>Percent Passing</u>
1/2 in.	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

Maximum size of stone in gravel shall be 6 inches largest dimension

- B. Select Fill:

- 1. Processed Gravel for pavement sub-base shall conform to the Massachusetts Highway Department Standard Specifications, Section M1.03.1 “Processed Gravel for Sub-Base” and shall be hard, durable stone of proper size and gradation and coarse sand, unfrozen and substantially free from vegetation, roots, loam and other organic matter, clay, snow, frozen particles and other fine or harmful substances.

Processed gravel shall be graded within the following limits:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
3-in	100
1-1/2-in	70 to 100
1/4-in	50 to 85
No. 4	30 to 60
No. 200	0 to 10

- 2. Screened Gravel. Screened gravel shall consist of hard, durable, particles of proper size and gradation, free from sand, loam, clay, excess fines and deleterious materials. The size of the particles shall be uniformly graded gravel such that not less than 95 percent of the particles will pass a 1/2-in sieve, 40 to 70 percent will pass the 3/8-in sieve, and not more than 5 percent will pass a No. 4 sieve.

EARTHWORK
02200-4

3. Crushed stone. Crushed stone shall consist of sound, durable stone, free of any foreign material, angular in shape, free from structural defects and comparatively free of chemical decay. The stone shall be maximum size of 1-1/2-in and a minimum size of 1/2-in. Crushed stone shall be used as ordered by the Engineer.
4. 3/4-inch Crushed Stone: Durable, clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1"	100
3/4"	95-100
1/2"	35- 70
3/8"	0- 25

5. Sand: Sand shall conform to MassDOT Specification M4.02.02.

- C. Topsoil: Friable loam, typical of fertile local topsoil; free from pure clay, weeds, noxious weed seeds, sod, clods and stones larger than 1 inch, toxic substances, litter, or other deleterious material; having a mildly alkaline to medium acid pH between 6.0 and 7.5. Soluble salts shall not exceed 4 milli-mhos per centimeter.

Soil Texture: 20 to 40% fines (silt and clay fraction passing the 200 sieve) and 60 to 80% Sand and gravel. The maximum particle size shall be 1-inch.

Organic Content: 5 to 10%

Additives: As required by soil analysis of Topsoil for lawn areas.

- D. Controlled Density Fill (CDF) or “Flowable Fill”: Controlled density fill shall consist of a flowable, self-consolidating, rigid setting, low density mixture meeting performance standards as specified in Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, Type 1E. CDF is to be batched at a ready mix plant and is to be used at a high or very high slump of approximately 10 to 12 inches. It shall be flowable, require no vibration and after it has been placed can be excavatable by hand tool and/or small machines. The ingredients shall comply with the following:
- Portland Cement – AASHTO M 85
 - Fly Ash – AASHTO M 295 Class F
 - Sand – M4.02.02 (Massachusetts Highway Specification)
 - Controlled Density Fill shall be used as ordered by the Engineer and as shown on the Drawings as backfill for trenches within the State Highway Layout.

2.2 DUST CONTROL

- A. Calcium chloride shall conform to AASHTO M144, Type I or Type II.

EARTHWORK
02200-5

PART 3 – EXECUTION

3.1 EXCAVATION

- A. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.
- B. Do not remove excavation materials from the site of the work or dispose of except as directed or permitted by the Engineer.
- C. Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to private property during construction, and remove said structures thereafter.
- D. Trenches shall be excavated to sufficient depths and to sufficient widths for installing new pipe/components where required, placing and removing of decking, sheeting and bracing, and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer. Trench width and depth shall be a practical minimum, as needed for proper execution for the work.
- E. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.
- F. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by gravel borrow as required by the Engineer at the Contractor's expense.
- G. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, the Contractor shall use a smooth-edge bucket to excavate the last one foot of depth.
- H. Where pipe is to be laid in screened gravel, the trench may be excavated by machinery to the normal depth of the pipe plus the depth of the stone, provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
- I. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

EARTHWORK 02200-6

- J. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.
- K. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.
- L. Excavate trenches with approximately vertical sides for entire depth of trench.

3.2 STOCKPILING OF SURPLUS EXCAVATED MATERIALS

- A. The Contractor shall strip and stockpile excavated trench materials. Any bushes that are removed shall be protected and replanted in the same location. Removed curbing shall be stockpiled in a safe manner. Where grassed areas are disturbed by stockpiled materials, the Contractor shall rake out the area and loam and re-seed at his expense.
- B. Stockpiling of materials shall be included in the pay items for excavating and no allowances shall be made for any stripping and stockpiling requirements.
- C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor. When required, it shall be re-handled and used in backfilling the trench.

3.3 PROTECTION OF EXISTING STRUCTURES

- A. Carefully support and protect from damage, existing pipes, poles, wires, fences, curbs, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun. Contractor shall hand dig around existing utilities.
- B. Curbing, fencing, sign posts, utility poles, mailboxes, etc. in the vicinity of the Contractor's operations shall be adequately protected, and if necessary removed and restored after backfilling. All items which are damaged during construction shall be replaced with material fully equal to that existing prior to construction.
- C. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
- D. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of

EARTHWORK
02200-7

grafting wax or tree healing paint as directed.

- E. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish in their beauty or usefulness, replace by items of equal kind and quality existing at the start of the work.
- F. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces.
- G. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

3.4 RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

- A. Whenever certain existing structures, as described below, are encountered, and the Engineer so directs, change the location, remove and later restore, or replace such structures, or assist the Owner in doing so. Such work to be paid for under applicable items of work, otherwise as Extra Work.
- B. In removing existing pipes or other structures, include for payment only those new materials which are necessary to replace those unavoidably damaged as determined by the Engineer.
- C. The preceding two paragraphs apply to pipes, wires, and other structures which meet the following: (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

3.5 EXCAVATION SUPPORT SYSTEM

- A. Furnish, put in place and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he/she may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

EARTHWORK 02200-8

- B. When moveable trench bracing such as trench boxes, manhole boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.
- C. When installing pipe; trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompacted to provide uniform side support for the pipe.
- D. The Contractor will be permitted to use steel sheeting in lieu of wood sheeting for the entire job wherever the use of sheeting is necessary. The cost for use of sheeting will be included in the bid items for pipe and shall include full compensation for driving, bracing and later removal of sheeting.
- E. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.
- F. The Contractor shall receive no payment, for sheeting, bracing, etc., during the progress of the work. The Contractor shall receive no payment for sheeting which has actually been left in the trench for the convenience of the Contractor.
- G. Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least 1-ft above the top of the pipe.

3.6 BACKFILLING

- A. As soon as practicable after the pipe has been laid and jointed and inspected by the Engineer, backfilling shall begin and thereafter be prosecuted expeditiously. Screened gravel shall be placed by hand shovel in 6-inch thick lifts up to the springline of the pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled.
- B. Where the pipes are laid in streets, the remainder of the trench up to a depth of 12-inches below the bottom of the specified permanent paving shall be backfilled with gravel borrow material in layers not to exceed 6-inches and thoroughly compacted. The sub-base layer shall be 12-inches of processed gravel thoroughly compacted.
- C. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level 12-inches over the pipe.
- D. Unfavorable Conditions:

EARTHWORK 02200-9

1. In no case shall fill be placed over material that is frozen. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.
 2. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth wheeled roller to eliminate ridges of soil left by compaction equipment.
- E. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300 feet, whichever is less.
- F. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the testing laboratory has advised the Engineer that adequate densities are obtained.
- G. Subject to the approval of the Engineer, fragments of ledge and boulders smaller than 6-in may be used in trench backfill providing that the quantity in the opinion of the Engineer, is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to insure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.
- H. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.
- I. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.
- J. Exploratory excavation shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.7 COMPACTION

- A. **Compaction Requirements:** The degree of compaction is expressed as a percentage of the maximum dry density at optimum moisture content as determined by ASTM Test D1557, Method C. The compaction requirements are as follows:

EARTHWORK 02200-10

Area	ASTM Density Degree of
Pavement sub-base	95%
General fill below pavement sub-base	92%

B. Moisture Control:

1. Fill that is too wet for proper compaction shall be dried to a proper moisture content to allow compaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill.
2. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

C. Compaction Control:

1. In-place density tests shall be made in accordance with ASTM D1556, D2922 or D2167 as the work progresses, to determine the degree of compaction being attained by the Contractor. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to the Owner. In-place density tests will be made by a geotechnical engineer selected by the Engineer or the Contractor's independent testing laboratory at the Contractor's expense.
2. The Engineer's duties do not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Engineer nor any observation and testing performed by him shall excuse the Contractor from defects discovered in his work at that time or subsequent to the testing.

D. Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill, grading and embankment.

1. Field In-Place Density and Moisture Content - Screened gravel and crushed stone shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than one test per lift:
 - a. Trenches under structures foundation preparation or roadways sub-base: Every 100 lin. ft. per lift.
 - b. Trenches in areas without structures or roadways: Every 250 lin. ft. per alternate lift.
 - c. Paved Roadways: Every 100 lin. ft. per lift.
 - d. Paved Areas: 2,000 sq. ft. per lift.

EARTHWORK
02200-11

- e. Under Structure: 1,000 sq. ft. per lift.
 - f. Around Structures: 1,500 sq. ft. per lift.
 - g. Embankment Fills: 5,000 sq. ft. per lift.
2. Moisture Density - One per source, except for screened gravel and crushed stone. Repeat the moisture density test for every 1,000 cubic yard of material use, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.
 3. Gradation Analysis - A minimum of one per source and for each moisture density test and whenever visual inspection indicates a change in material gradation.
 4. Liquid Limit, Plastic Limit and Plasticity Index - Minimum of one test per 500 cubic yards [382 cubic meters] of soil for use as fill material and whenever classification of material is in doubt as determined by the Engineer.

E. Compaction Methodology:

1. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.
2. Backfilling operations shall be such that material is compacted in 6 inch lifts, including the trench around the barrel of the pipe. Compaction of each lift up to a minimum of 12-inches above the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken as to not place excessive pressure on the new pipe.
3. Vibratory mechanical compaction is the preferred method for compaction. Should jetting be proposed by the Contractor, its viability to achieve the required degree of compaction shall be proven on a test section of trench, prior to allowing its use on a widespread basis. Compaction testing shall be used to determine the effectiveness of the jetting operation. Jetting shall be accomplished using a rigid pipe, long enough to reach deep into the trench. Large volumes of water under high pressure equivalent to that available from a fire hydrant, are necessary for jetting. The Contractor is made aware that municipal water may not be available due to limited supply. The Contractor shall provide water for jetting operations at his own expense. Jetting locations shall be frequent enough to achieve required compaction.
4. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material being spread and compacted in layers not over 6-in thick. If

EARTHWORK
02200-12

necessary, sprinkling shall be employed in conjunction with rolling or ramming.

5. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density at least equal to that of the surrounding undisturbed earth, and in such a manner as to permit the rolling and compaction of the filled trench or excavation with the adjoining earth to provide the required bearing value, so that paving of the excavated and disturbed areas, where required, can proceed immediately after backfilling is completed.

3.8 FINE GRADING

- A. Before surface or sub-base is spread, the subgrade shall be shaped to a true surface conforming to the Drawings. All depressions and high spots shall be filled with suitable material or removed and such areas again compacted until the surface is smooth and properly compacted. A tolerance of 1/2-inch above or below the finished subgrade will be allowed provided that this 1/2-inch above or below grade is not maintained for a distance longer than 50 feet and that the required crown is maintained in the subgrade. Any portion which is not accessible to a roller shall be thoroughly compacted by other mechanical methods.
- B. Construction Tolerances:
 1. Construct finished surfaces to plus or minus 1 inch of the elevations indicated.
 2. Grade cut and fill areas to plus or minus 0.20 foot of the grades indicated.
 3. Complete embankment edges to plus or minus 6 inches of the slope lines indicated.
 4. Provide the Engineer with adequate survey information to verify compliance with above tolerances.

3.9 DUST CONTROL

- A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application.
- B. Calcium chloride shall be uniformly applied at a rate of 1-1/2 pounds per square yard or at any other rate as directed by the Engineer. Application shall be by means of a mechanical spreader, or other approved method. The number and frequency of applications shall be determined by the Engineer.

3.10 PLACING TOPSOIL

EARTHWORK 02200-13

- A. Scarify compacted subgrade to a 2-inch depth to bond topsoil to subsoil. Place topsoil to a minimum depth of 4 inches for areas disturbed by Contractor's construction operations and as shown on the Drawings. Spread evenly and grade to elevations and slopes shown. Hand rake areas inaccessible to machine grading.

END OF SECTION 02200

EARTHWORK
02200-14

SECTION 02212

ROCK EXCAVATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Rock excavation may be required where boulders, monolithic concrete, reinforced concrete or stone structures measuring in excess of one cubic yards solid in volume or larger are encountered or solid ledge which, in the opinion of the Engineer, requires drilling, wedging, sledging, cutting, barring, or hydraulically fracturing for removal, is encountered.
- B. The following do not constitute rock excavation: hardpan; soft or disintegrated rock; concrete which can be removed with a pick; previously blasted rock or broken stone less than the above mentioned one cubic yard; stone walls; rocks or sections of blasted ledge that may fall into or be jarred loose from the sides of the trench beyond the maximum limits of excavation approved by the Engineer.
- C. **Blasting is not allowed.**

1.2 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to excavate and dispose of rock and boulders as shown on the Drawings and as specified herein.

1.3 RELATED WORK

- A. Section 01110 – Environmental Protection Measures
- B. Section 02200 – Earthwork

1.4 DELIVERY, STORAGE, AND HANDLING

- A. The delivery, storage, and handling of explosives shall be performed only by qualified persons licensed in Massachusetts, and shall be in full conformance with all laws, regulations, ordinances, and practices. Extreme care shall be taken to avoid injury or damage to persons or property.

1.5 DEFINITIONS

- A. Typical of materials classified as rock are boulders 1.0 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

ROCK EXCAVATION 02212-1

Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Engineer. If the area to be excavated is predrilled prior to the excavation of overburden soils, the Engineer shall be notified at least two days in advance to allow observation of the drilling by the Engineer in order to classify the excavation. Visual observation of the completed excavation may be made by the Engineer to modify the excavation classifications. Removal of rock excavation prior to classification by the Engineer shall be considered as earth excavation unless accepted by the Engineer in writing. Such excavation will be paid on the basis of contract unit rates for this classification.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Gravel borrow shall be as specified in Section 02200 under Common Fill.

PART 3 – EXECUTION

3.1 DISPOSAL OF ROCK AND BOULDERS

- A. Fragmented rock with dimensions not exceeding six (6) inches in any direction may be mixed with common fill, providing compaction requirements will not be compromised.
- B. Rock and boulders may be crushed and screened for reuse in the Work, provided that the resultant materials meet the requirements for gravel borrow, processed gravel, or crushed stone as specified in Section 02200.
- C. Unused rock and boulders shall be removed and disposed of off-site.

END OF SECTION 02212

ROCK EXCAVATION
02212-2

SECTION 02538

TEMPORARY BY-PASS SEWAGE PUMPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions - BIDDING AND CONTRACT REQUIREMENTS and other DIVISION 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Furnish, install, field test, and operate temporary by-pass pumping systems for the purpose of diverting sewage flow around work areas for the duration of the project. The pumping system shall protect against surcharging of the existing sewer system upstream of the work area by installing adequate temporary by-pass pumping to handle dry weather and wet weather flows. Provide all labor, tools, materials, and equipment necessary to by-pass flow around the work areas.
- B. The design, installation, and operation of temporary by-pass pumping systems shall be the Contractor's responsibility. The by-pass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
- C. By-pass operations shall be continuously monitored by the Contractor, regardless of duration or timing of by-passing. By-pass should be coordinated with low-flow times, to the extent feasible. Restore normal service to entire system at the end of normal working hours every day or post an attendant on-site. No unattended by-pass pumping will be allowed.
- D. Maintain temporary by-pass pumping systems so that they are completely functional throughout the required period of service.
- E. Provide all maintenance including manufacturer recommended preventative maintenance and on-call repair services. Contractor shall provide repair services and/or replacement equipment 24 hours per day, 7 days per week within 4 hours of being notified.
- F. The Contractor shall not allow sewage flow to discharge to any salt or fresh water body by means of overflow, by-pass pumping, or any other method that may contaminate these water areas.
- A. Except as specifically permitted, the installation of the by-pass pipelines is prohibited in all saltmarsh/wetland areas. The pipeline must be located off streets and sidewalks and on shoulders of the roads. When the by-pass pipeline crosses local streets and private driveways, the Contractor must place the by-pass pipelines in a portable hose ramp, or place temporary bituminous pavement, cold patch, or other approved material to

TEMPORARY BY-PASS SEWAGE PUMPING

02538-1

form a ramp on each side of the pipe to the satisfaction of the Engineer or by depressing the pipe as directed by the Engineer.

- G. The ramp shall be high load bearing capacity. Upon completion of the by-pass pumping operations, the Contractor shall remove all piping, restore all property to pre-construction condition, and restore all pavement. The Contractor is responsible for obtaining any approvals from the Owner for placement of the temporary pipeline within public ways.

1.3 SUBMITTALS

- A. Submit the following in accordance with the Conditions of Contract and Division 1 Specification Sections and as specified herein:
 - 1. A detailed description of the proposed pumping systems, project approach, and requirements here within:
 - 2. A detailed description of each proposed temporary by-pass pumping system including pumps, pump drives, piping, hoses, valves, fittings, controls, wiring, and other ancillary accessories required to provide a complete operating system.
 - 3. Complete list of system components to be provided.
 - 4. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
 - 5. Performance data for each type of equipment that will show compliance with specification requirements stated herein.
 - 6. Detailed plans and sections showing the proposed pumping system layout. Plan shall include but not limited to the following:
 - a. Staging area and access requirements for all pumps.
 - b. Number, size, material, location, and method of installation of suction piping.
 - c. Number, size, material, location, and method of installation of discharge piping.
 - d. Sewer plugging method and types of plugs.
 - e. Pump size, capacity, number of units, fuel tank capacity, fuel consumption requirements, and method of refueling.
 - 7. Emergency response plan describing the intended means of handling but not limited to the following:
 - a. Break or failure of by-pass piping.
 - b. Failure of by-pass pump.
 - c. Overflows.
 - d. Backup into dwelling or onto private property.

TEMPORARY BY-PASS SEWAGE PUMPING 02538-2

- e. Operations during inclement weather including snow storms.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 - Quality Assurance and as specified.
- C. The by-pass pumping system shall be standard equipment and totally suited for the application as detailed herein. The equipment to be furnished shall be satisfactory and safely designed, in accordance with the design parameters as detailed in these contract documents. It shall be constructed for continuous, automatic operation, for extended periods of time.
- D. All items shall be designed and constructed in full accordance with all applicable state and local codes and regulations. Labor, materials, and costs required to meet state codes shall be the responsibility of the Contractor and the professional by-pass pumping company.

1.5 FLOW DATA

- A. The project area consists of active sanitary sewers; therefore, flows and flow data are variable depending on location and conditions. It is the responsibility of the Contractor to maintain flows in accordance with this specification under all flow conditions. The bypass system shall be capable of pumping at the existing pump station capacity.

PART 2 - MATERIALS

2.1 PUMPING EQUIPMENT

- A. Each temporary by-pass pumping system shall be complete including pumps, drives, piping, piping headers, valves, flow meter, controls, and appurtenances as required for a complete system.
- B. The pumps, drives, and controls shall be designed and built for 24-hour continuous service at any and all points within the required range of operation, without overheating, without cavitation, and without excessive vibration or strain. All parts shall be so designed and proportioned as to have the strength, stability, and stiffness and be constructed to meet the specified requirements. Methods shall be provided for inspection, repairs, and adjustment.
- C. All equipment shall be suitable for outdoor operation under adverse weather conditions. Provide protection from freezing as required to maintain system operation.
- D. Each pump shall be able to pass typical municipal sewage.
- E. Pumps shall be provided with noise protective acoustically-silenced enclosures that meet all local, MA DEP, and Local construction noise requirements and as a

minimum: 80 dBA at seven feet; 65 dBA at thirty feet; 60 dBA at nearest residence; and less than 10 dBA raised above background levels; and no pure tone condition. Contractor shall be responsible for all materials, labor, and equipment to show compliance with the above requirements.

- F. Pumps shall be provided with secondary containment for diesel operated pumps.

2.2 ADDITIONAL EQUIPMENT

- A. Provide all required suction and discharge pipe and fittings, discharge manifold pipe and fittings, shutoff valves, check valves, flow meter, pressure regulating valves, insulation, freeze protection, and all required accessories.
- B. All pipe and fittings shall be steel with flanged or quick connect coupling connections, or high density polyethylene pipe with fused joints or approved equal. Joints shall be Victaulic or equal. Suction piping shall be rated for 25-in Hg vacuum. Discharge piping, fittings, connections, valves, and other discharge piping accessories shall be rated for a minimum working pressure of 150 psi.
- C. Lay flat hose shall be extra heavy duty, highly abrasive resistant and fitted with gasketed couplings. Hose shall be rated for a minimum working pressure of 150 psi.
- D. Aluminum "irrigation" type piping or glued PVC pipe will not be allowed.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor must provide for 100% redundancy (two pumps shall be provided AT THE SITE for every one pump required) if flow cannot be returned to the sewer at any time if pumping system failure occurs. Redundant pump shall include suction and discharge piping.
- B. The Contractor shall adequately handle all flow, even instantaneous peak flows, without damage or overflow. The Contractor shall make himself aware of potential large instantaneous flow contributors connected to the sewer.
- C. Plugging or blocking of sewage flows shall incorporate primary and secondary plugging devices. When plugging or blocking is no longer needed for performance and acceptance or Work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.
- D. The by-pass pumping system shall not require excavation to reduce the suction lift without approval of the Engineer. Pumps may not be benched down to make the suction lift unless approved by the Engineer.

- E. The Contractor shall exercise caution and comply with OSHA requirements when working in the presence of gases, combustible or oxygen-deficient atmospheres, and confined spaces.

3.2 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01610 - Delivery, Storage, and Handling and as specified herein. Ship equipment, materials and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
- B. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
- C. Deliver spare parts at same time as pertaining equipment.
- D. Store and safeguard equipment, material, and spare parts.

3.3 INSTALLATION

- A. Install pumping units on a firm level surface.
- B. Equipment failing to meet specific conditions shall be removed and replaced at no additional cost to the Owner.

3.4 FIELD TEST AND QUALITY CONTROL

- A. The piping system must provide adequate water tightness. The Engineer may require the Contractor to perform a leakage test with clean water if in the Engineer's sole opinion the piping system appears as though it may leak.
- B. Any such testing shall be to the Engineer's satisfaction and shall be at the Contractor's expense.
- C. In the event that a unit fails to pass a test, make all modifications required to place the unit in proper working order.
- D. In the event that a unit fails a test a second time, remove the unit and replace with a satisfactory one, at no cost to the Owner.
- E. The Contractor shall provide all necessary instrumentation, equipment, devices, and appurtenances, as well as temporary wiring or piping, required to perform field tests.

3.5 SYSTEM OPERATION

- A. The by-pass pumping operations must be attended at all times. Unattended by-pass will not be allowed. If by-pass pumping must continue past working hours an attendant must be present at all times.

TEMPORARY BY-PASS SEWAGE PUMPING 02538-5

- B. Perform all required maintenance on the equipment to maintain the system integrity and capacity as specified.
- C. Provide clean-up and disposal of contaminated material and reporting for all product spills.
- D. At the completion of the period of service, disconnect all temporary piping and remove all system components from the site. Restore the work site to its original condition

3.6 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 - Contract Closeout.

END OF SECTION 02538

TEMPORARY BY-PASS SEWAGE PUMPING
02538-6

SECTION 02570

SEWERS, STRUCTURES AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies requirements for the proposed sewer force main bypass piping, fittings and valves; and associated items.
- B. The work includes furnishing and installing sewer pipes, fittings, structures, and other appurtenances required and in accordance with the Drawings and Specifications.

1.2 RELATED WORK

- A. Section 02200 – Earthwork
- B. Section 02616 – Ductile Iron Pipe and Fittings for Buried Sewer Force Main
- C. Section 02640 – Valves and Appurtenances

1.3 SUBMITTALS

- A. List of materials proposed and manufacturers' specifications and installation instructions.
- B. Shop drawings for all material and structures prior to ordering materials, including pipe materials, connections, fittings and valves, precast concrete sewer manholes and frames and covers, and component construction, features, configuration, and dimensions.

1.4 INSPECTION

- A. All pipe may be inspected at the plant for compliance with these specifications by an independent testing laboratory selected and paid for by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections.
- B. Inspection of the pipe may also be made after delivery. The Contractor shall furnish all labor to assist the Engineer in inspecting the pipe. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though pipe samples may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the site at once.

SEWERS, STRUCTURES AND APPURTENANCES

02570-1

- C. Imperfections in materials may be repaired, subject to approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval.

1.5 DELIVERY, STORAGE & HANDLING

- A. All materials shall be adequately protected from damage during transit. Pipes shall not be dropped.
- B. All pipe and other appurtenances shall be inspected before placement in the work and any found to be defective from any cause, including damage caused by handling, and determined by the Engineer to be unrepairable, shall be replaced at no cost to the Owner.
- C. Storage and handling of pipes, manholes and other sewer system appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the Engineer.
- D. Only nylon-protected slings shall be used for handling the pipe. No hooks or bare cables will be permitted.
- E. Pipe shall be stored above ground at a height no greater than 5 feet, and with even support for the pipe barrel.

PART 2 - PRODUCTS

2.1 FORCE MAIN BYPASS CONNECTION HANDHOLE

- A. Precast Units:
 - 1. Bypass Connection Handhole: 4,000 psi minimum compressive strength. All units shall be designed for HS-20 loading.
 - 2. The date of manufacture, trademark and name of the manufacturer shall be clearly marked on the inside of each precast section.
- B. Masonry:
 - 1. Brick for construction of inverts and adjusting manholes to grade shall be Grade SS conforming to ASTM C32. Red clay sewer brick shall be used and the inverts shall be smoothly rounded to the direction of flow.
 - 2. Mortar shall be in conformance with ASTM C270, Type M. The mortar shall be composed of Portland Cement hydrated lime, and sand, in the proportions of 1 part cement to ¼ part hydrated lime to 3-1/2 parts sand, by volume.

SEWERS, STRUCTURES AND APPURTENANCES

02570-2

3. Cement shall be Type I or II Portland cement conforming to ASTM C150, Standard Specification for Portland Cement. Where masonry is exposed to salt water, Type II shall be used.
 4. Hydrated lime shall be Type S conforming to ASTM D207.
 5. Sand for masonry mortar shall conform to the gradation requirements of ASTM C144.
- C. Manhole Frame and Cover:
1. Provide heavy duty cast iron frame and cover, minimum Class 25 conforming to ASTM "Standard Specification for Gray Iron Castings," designation A48. The words "SEWER" shall be embossed on cover. Letter size shall be three inches. Frame shall have a clear opening dimension of 24 inches and the frame shall a minimum of 6 inches in height. The frame and cover shall be watertight up to 15 psig external pressure.
- D. Pipe Connections: Pipe penetrations shall be sealed using non-shrink grout. Refer to Section 03300 for non-shrink grout specifications.
- E. Dampproofing Bitumastic Coating: The entire exterior surface of all structures shall be coated with two coats of an approved bitumastic material using cutback asphalt, AASHTO M81 or M82, Asphalt emulsion AASHTO M140 or approved equal, at 5 gallons per 100 square feet minimum per coat to produce a dry film thickness of 0.07 inches (7 mils) per coat. Touch up in the field prior to backfilling as required by ENGINEER.

2.3 DUCTILE IRON PIPE AND FITTINGS FOR BURIED SEWER FORCE MAIN

- A. Refer to Section 02616 – Ductile Iron Pipe and Fittings for Buried Sewer Force Main.

2.1 BURIED UTILITY WARNING AND IDENTIFICATION TAPE

- A. Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED SEWER PIPING BELOW or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

PART 3 - EXECUTION

SEWERS, STRUCTURES AND APPURTENANCES

02570-3

3.1 EXCAVATION AND BACKFILLING

- A. The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of Section 02200 – Earthwork, and the details shown on the Drawings.

3.2 PIPE INSTALLATION

- A. All sewer piping shall be laid accurately to the lines and grades shown in the Drawings and in conformance with pipe manufacturer's recommended procedures.

- B. Laying Pipe:

1. Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a prepared trench. Pipe shall be laid with bells upgrade unless otherwise approved by the Engineer.
2. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash. Extreme care shall be taken to keep the bells of the pipe free from dirt and rocks so that joints may be properly lubricated and assembled.
3. No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, to prevent movement or disturbance of the pipe alignment.
4. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.

- C. Pipe Extension: Where an existing pipe is to be extended, the same type of pipe shall be used, unless otherwise approved by the Engineer.

- D. Protection During Construction: The Contractor shall protect the installation at all times during construction, and movement of construction equipment. Vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's risk and in accordance with all applicable federal, state and local safety regulations.

At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary water-tight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been properly dewatered and all danger of water entering the pipe eliminated. The Contractor is responsible for proper dewatering to ensure a stable pipe foundation. Proper dewatering to two feet (minimum) below the pipe invert to ensure joining of the pipe in a dry condition.

- G. Water Pipe – Sewer Pipe Separation: When a sewer pipe crosses above or below a water pipe, the following procedures shall be utilized. The Contractor shall comply with these following procedures.

SEWERS, STRUCTURES AND APPURTENANCES

02570-4

1. Relation to Water Mains

- a. Horizontal Separation: Whenever possible sewers shall be laid at a minimum at least ten feet (10'), horizontally from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet to a water main, if:
 - i. It is laid in a separate trench, or if
 - ii. It is laid in the same trench with the water mains located at one side on a bench of undistributed earth, and if
 - iii. In either case the elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.
- b. Vertical Separation: Whenever sewers must cross under water, sewer is at least eighteen inches (18") below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with mechanical-joint pipe for a distance of ten feet (10') on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.
- c. When it is impossible to obtain horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement lined ductile iron pipe or other equivalent based on water tightness and structural soundness. Both pipes shall be pressure tested by an approved method to assure water tightness or both pipes shall be encased in concrete.

3.3 LAYING DUCTILE IRON PIPE AND FITTINGS

- A. Refer to Section 02616 – Ductile Iron Pipe and Fittings for Buried Sewer Force Main.

3.4 DUCTILE IRON PIPE JOINTS

- A. Refer to Section 02616 – Ductile Iron Pipe and Fittings for Buried Sewer Force Main.

3.5 CONNECTIONS TO EXISTING FACILITIES

- A. General Requirements: The Contractor shall make all required connections of the proposed sewer into existing sewer system, where and as shown on the Drawings and as required by the Engineer.
- B. Compliance with Requirements of Owner of Facility: Connections into existing sewer facilities shall be performed in accordance with the requirements of the Owner

SEWERS, STRUCTURES AND APPURTENANCES

02570-5

of the facility. The Contractor shall comply with all such requirements, including securing of all required permits, paying the costs thereof, and providing twenty-four (24) hour notice prior to beginning the work.

3.6 PRESSURE TESTING OF SEWER FORCE MAIN

- A. Hydrostatic and leakage test shall be conducted in accordance with AWWA Standard C600, and in the presence of the Engineer. Testing shall be conducted by a certified independent water testing company.
- B. Conduct pipe tests after concrete thrust blocks have cured to the required 3000 psi strength. Fill pipe 24 hours prior to testing, and apply test pressure to stabilize system. Use only potable water.
- C. Prior to pressure testing, the entire pipe section shall be flushed to remove any rocks or debris, which may have inadvertently entered the pipe during construction.
- D. Once the pipe section has been filled at normal pressure and all entrapped air removed, the Contractor shall raise the pressure to 150 psi or two times the operation pressure (whichever is greater) by a special pressure pump, taking water from a small tank of proper dimensions for satisfactorily measuring the rate of pumpage into the pipe. This pressure shall be maintained for a minimum of 2 hours, during which time the line shall be checked for leaks. Measured rate of water leakage shall not exceed the allowable leakage listed below:

Bypass piping shall have zero leakage.

Should leakage exceed this rate, the Contractor shall immediately locate the leak or leaks and repair them. Pipe will be accepted only when leakage is zero, or less than the allowable amount. Approval does not absolve the Contractor from responsibility if leaks develop later within the warranty period.

3.7 CLEANING AND REPAIR

- A. The Contractor shall clean the entire system of all debris and obstructions. This shall include, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sewers, storm drains or streams. All work of cleaning and repair shall be performed at no additional cost to the Owner.

3.8 FINAL INSPECTION

- A. Upon Completion of the work, and before final acceptance by the Engineer, the entire system shall be subjected to a final inspection in the presence of the Engineer. The work shall not be considered as complete until all requirements for line, grade, cleanliness, leakage tests and other requirements have been met.

SEWERS, STRUCTURES AND APPURTENANCES

02570-6

END OF SECTION 02570

SEWERS, STRUCTURES AND APPURTENANCES
02570-7

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SECTION 02576

PAVEMENT REPAIRS AND RESURFACING

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. This section includes the removal and replacement of existing bituminous pavement and sub-base; installation of temporary pavement; milling and installation of permanent pavement overlay; removal and replacement of curb and gutter (as required); removal and resetting of curbing (as required); raising and adjusting castings and valve boxes; and installation of pavement markings.

1.2 RELATED WORK

- A. Section 02200 – Earthwork

1.3 REFERENCE STANDARDS

- A. Except as otherwise specified herein, the current Standard Specifications for Highways and Bridges, including all addenda and supplemental information, issued by the Commonwealth of Massachusetts Department of Transportation, shall apply to materials and workmanship required for the work of this Section.
- B. American Association of State Highways and Transportation Officials (AASHTO) AASHTO M144 - Standard Specification for Calcium Chloride.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - Submittals.
 - 1. Product Data: Submit complete data on materials to be used in construction, including gradation tests for granular base.
 - 2. Design Data: Submit design mix for bituminous base and top (wearing) course.
 - 3. Material Certificates: Provide copies of materials' certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PAVEMENT REPAIRS AND RESURFACING 02576-1

1.5 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. Laboratory Testing Required:
 - 1. The bituminous mixture shall be compacted to at least 95% of the density achieved on the laboratory testing of the design mix for the project. The density of the Bituminous Concrete Pavement will be determined by using either the following tests; Nuclear Density Gauge Method ASTM D2950 or the Bulk Specific Gravity Method AASHTO-T166.
- C. Thickness: Test in-place asphalt concrete courses for compliance with requirements for thickness. Repair or remove and replace unacceptable paving as directed by Engineer. In-place compacted thickness will not be accepted if exceeding the following allowable variation from required thickness:
 - 1. Base Course: ¼-inch, plus no minus
 - 2. Top Course: ¼-inch, plus no minus

1.6 PROJECT SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not place materials when underlying surface is muddy, frozen, or has frost, snow, or water thereon.
 - 2. Do not place concrete when air temperature at time of placement, or anticipated temperature for following 24 hours, is lower than 40°F or higher than 90°F.
 - 3. Apply prime and tack coats when ambient temperature is above 50°F and when temperature has not been below 35°F for 12 hours immediately prior to application.
 - 4. Binder Course may be placed when air temperature is above 30°F and rising.
 - 5. Grade Control: Establish and maintain required lines and elevations.
- B. Existing Conditions:
 - 1. Drawings show approximate locations of paving areas.
 - 2. Drawings show approximate location of existing structures along pipeline route.

PAVEMENT REPAIRS AND RESURFACING
02576-2

1.7 GUARANTEE

- A. All final pavement placed shall be warranted by the Contractor for a period of one year. During this period all areas which have settled or are unsatisfactory for traffic shall be removed and replaced at no cost to the Town, including the cost of Traffic Police. Settlement in excess of one (1) inch shall be considered significant, and shall be repaired.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Calcium chloride shall conform to AASHTO M144, Type I or Type II.
- B. Bituminous concrete shall conform to Class I Bituminous Concrete Pavement, Type I- 1, of Section 460 of the Massachusetts Highway Department Standard Specifications.
- C. Binder Course and Modified Top Course shall conform to the Massachusetts Highway Department Standard Specifications, Section M3.11.00, Class I, bituminous concrete.
- D. Tack coat shall be emulsified asphalt, grade RS-1 and conform to the Massachusetts Highway Department Standard Specifications, Section M3.03.0.
- E. Cutback asphalt shall conform to the Massachusetts Highway Department Standard Specifications, Section M3.02.0.
- F. Sub-base material shall be new processed gravel conforming to the Massachusetts Highway Department Standard Specifications, Section M1.03.1 “Processed Gravel for Sub-Base”.
- G. Pavement markings shall conform to the Massachusetts Highway Department Standard Specifications, Section M7.01.23 - White Traffic Paint and M7.01.24 - Yellow Traffic Paint.

PART 3 – EXECUTION

3.1 GENERAL

- A. After completion of the backfilling and 12-inch cutback, final pavement shall be placed unless otherwise directed in writing by the Engineer.
- B. Materials for pavement shall be mixed, delivered, placed, compacted, and tested in accordance with the referenced specification, Sections M3.11 and 460 and as

PAVEMENT REPAIRS AND RESURFACING
02576-3

specified herein.

- C. Whenever the sub-base becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate the dust.
- D. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.
- E. Pavement Construction Period. No pavement shall be constructed during the period from November 15 to March 31 without approval in writing from the Engineer.

3.2 PREPARATION

- A. Protection of existing Roadways:
 - 1. Saw cut existing pavement to required width and depth to avoid damage to adjacent pavement, curbs, gutters, or other structures and as indicated on the drawings.
- B. Sub-Surface Preparation:
 - 1. Pavement Sub-base:
 - a. Pavement sub-base material shall be as specified in Section 02200, and as shown on the Drawings.
 - b. The sub-base to be placed under pavement shall be a minimum of 12- inches thick after compaction. Sub-base shall be evenly spread and thoroughly compacted in accordance with the Contract Documents. The sub-base shall be spread in layers not more than 8 - inches thick except the last layer of gravel shall be 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.
 - c. Complete sub-base preparation, including dynamic compaction, for full width before placing surfacing materials.
 - 2. Subgrade:
 - a. Prepare subgrade in accordance with Section 02200.
 - b. Complete subgrade preparation, including dynamic compaction, for full width before placing surface materials.

PAVEMENT REPAIRS AND RESURFACING 02576-4

- c. Stabilize subgrades in accordance with Section 02200 so that loaded construction vehicles do not cause rutting or displacement when depositing materials.

3.3 INSTALLATION

A. General

1. Pavement depths shall be as shown on Drawings or as specified herein.
2. Place bituminous concrete mixture on prepared surface, spread, and strike-off. Spread mixture at minimum temperature of 225 °F (107 °C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness. Protect all adjacent construction from staining with mix or damage by mechanical equipment. Clean, repair, or replace any construction stained or damaged at no additional cost to the Owner.

B. Permanent trench pavement:

1. For areas with temporary pavement, permanent trench pavement shall be placed after the 90-day settling period. The temporary trench pavement and sub-base shall be excavated, graded, and compacted to a depth below the existing pavement (see Drawings for depths).
2. For areas not receiving temporary pavement, permanent trench pavement shall be placed wherever existing pavement has been removed or disturbed as soon as practical after backfilling is completed.
3. Depth of permanent trench pavement is indicated on the Drawings.
4. The existing pavement shall be saw-cut, removed and properly disposed of one foot beyond the limits of temporary trench pavement to create an offset subbase joint. All pavement edges shall be square and straight. Irregular, jagged edges will not be allowed.
5. Hose clean with water all road surfaces adjacent to the area to be paved. No paving is to be placed until sub-base surface is dry.
6. The permanent trench pavement layer shall be a hot mixed binder course placed and compacted to a thickness identified on the Drawings by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete without damaging the existing pavement.
7. The top course shall be placed and compacted to a thickness identified on the Drawings. The new pavement shall be rolled smooth and even with the existing pavement.

PAVEMENT REPAIRS AND RESURFACING 02576-5

8. The binder course shall be placed by normal construction practices. The top course shall be machine laid utilizing a sidewalk box spreader or equal; no hand work is allowed. Prior to top course all seams shall be sealed with an approved emulsified liquid asphalt and sand. The top course of the permanent trench paving shall be placed to a grade that shall not overlap the existing pavement.
9. The finished surface of the top course mixture, after compaction, shall be true to the established line and grade of the existing pavement.

D. Pavement Placement

1. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing shall be used. Methods other than machine methods may be used, at no additional cost to the Owner. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width, and crown. The mixtures shall be placed and compacted only at such times as to permit proper inspection and checking by the Engineer.
2. After the paving mixtures have been properly spread, initial and immediate compaction shall be obtained by the use of steel rollers having a weight of not less than 240 pounds per inch width tread. Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot tampers or vibrating plate compactors in areas inaccessible to rollers. Accomplish breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material. Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
3. Final rolling of the pavement shall be performed by a steel wheel roller weighing not less than 285 pounds per inch width of tread at a mix temperature and time sufficient to allow for final smoothing of the surface and thorough compaction. Continue rolling until roller marks are eliminated and course has attained maximum density.
4. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot bituminous concrete. Compact by rolling to match surrounding surface density and smoothness.
5. Immediately after placement of new pavement, make joints between existing and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other section of bituminous concrete course. Clean contact surfaces and apply tack coat. All joints between the existing and new pavements shall be keyed on an angle (4' x 10') or as approved by

PAVEMENT REPAIRS AND RESURFACING
02576-6

the Owner, and shall be sealed with bitumen RS-1 and sanded.

6. The Contractor shall furnish and install paving to provide transition or aprons for driveways and walkways impacted by new pavement installation.

E. Pavement Markings:

1. The Contractor shall replace all reflectorized pavement markings removed or covered-over in carrying out the work, and as directed by the Engineer, no sooner than 48 hours after completion of final pavement. Markings shall conform to the latest standards of the municipality or agency having jurisdiction over the roadway. The markings shall be painted markings, 4-inches wide, white or yellow, single or double lines as required. Materials shall conform to MassDOT Standard Specifications for Highway and Bridges, latest edition, M.7.01.23 and M.7.01.24.
2. The Contractor shall provide temporary markings on the temporary pavements where existing markings are removed at no additional cost to the Owner.

G. Curb and Gutter Replacement:

1. Replace curb and gutter with same material to pre-construction lines and curb sections. Reset granite curb to pre-construction line and grade.
2. Removal and replacement of curbing shall be done in accordance with Sections 501 and 580, as applicable of the MHD Specifications for Highways and Bridges.
3. Provide expansion joints at each intersection with existing curb sections.
4. Use expansion joints one inch wide. Fill with expansion joint material and cut to shape of curb section.

H. Sidewalk Replacement:

1. Gravel sidewalks:
 - a. Gravel sidewalks shall be restored to a condition at least equal to that existing immediately before the work was started.
2. Bituminous concrete sidewalks:
 - a. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.
 - b. The subgrade shall be shaped parallel to the proposed surface of the sidewalk or driveway and shall be thoroughly rolled and tamped.

PAVEMENT REPAIRS AND RESURFACING
02576-7

All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard in order for a gravel foundation to be placed upon it.

- c. The sidewalk or driveway shall be a minimum of 3 inches compacted inches thick, laid in two equal courses.
 - d. Sidewalk cross slopes shall not exceed 2 percent as required by the Americans with Disabilities Act (ADA). The Contractor shall merge new sidewalk slopes into existing sidewalk slopes as required by ADA.
3. Cement concrete sidewalks:
- a. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.
 - b. Use 6 x 6, W10 x W10 welded wire reinforcement.
 - c. Concrete sidewalks shall be 4-inches thick and concrete driveways shall be 6-inches thick.
 - d. The subgrade for the walk or driveway shall be shaped to a true surface conforming to the proposed slope of the walk, thoroughly rolled at optimum moisture content, and tamped with a power roller weighing not less than one ton and not more than 5 tons. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard.
 - e. After the subgrade has been prepared, a sub-base of gravel at optimum moisture content shall be placed, thoroughly rolled by a power roller, and tamped. The gravel shall be a minimum of 8 inches in thickness.
 - f. The forms shall be smooth, free from warp, strong enough to resist springing out of shape, and deep enough to conform to the thickness of the proposed walk or driveway. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked, thoroughly braced, and set to the established lines with their upper edge conforming to the grade of the finished walk or driveway.
 - g. The finished surface shall have sufficient pitch from the outside edge to provide for surface drainage. This pitch shall be 1/4 of an inch per foot unless otherwise directed by the Engineer. Before the concrete is placed, the sub-base for sidewalks shall be thoroughly dampened until it is moist throughout but without puddles of water.

PAVEMENT REPAIRS AND RESURFACING
02576-8

4. General:

- a. Valve boxes, manhole frames, and all other castings shall be carefully set to the proposed finished grades.

I. Berms and Waterways

1. Bituminous curbing shall be replaced as required. Curbing shall be machine laid and conform to grade of roadway and adjacent curb areas.
2. Bituminous berms shall be replaced as required. Berms shall be machine laid and conform to the grade of the roadways. Berms shall be placed in accordance with MHD Specification 470.20.
3. Bituminous waterways which have been disturbed by construction operations shall be repaired or replaced. The waterways shall be repaired and constructed in accordance with the applicable requirements of Section 280 of the MHD Specifications. Waterways shall be placed in two 1-1/2-inch thick courses on a prepared gravel base. Material shall be compacted by tamping or rolling.

3.4 PROTECTION

- A. Protect replacement work with barricades or other devices as approved by Engineer so that no damage occurs as a result of subsequent construction operations.
 1. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
 2. Repair damages or other irregularities to satisfaction of Engineer, at no additional cost to the Owner, before final acceptance by the Engineer.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02576

PAVEMENT REPAIRS AND RESURFACING
02576-9

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SECTION 02616

DUCTILE IRON PIPE AND FITTINGS FOR BURIED SEWER FORCE MAIN

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Furnish all materials, equipment, labor and incidentals; provide for the installation and testing; of all ductile-iron pipe and fittings, as indicated and specified.

1.2 RELATED WORK

- A. Section 02200 – Earthwork.
- B. Section 02570 – Sewers, Structures, and Appurtenances

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings or descriptive literature, or both, showing dimensions, joint and other details for each type and class of pipe, fitting and restraint system to be furnished for the project. All materials furnished under the Contract shall be manufactured only in accordance with the Specifications. Submittals shall include material information, dimensions, pipe class information, weights, coating and lining system data.
 - 2. Submit manufacturer's Certificates of Compliance with these Specifications and certification that the ductile iron pipe and fittings have been manufactured and tested in accordance with AWWA/ANSI specifications.
 - 3. Submit the vendor's name, address and contact phone number for all materials to be furnished under the contract.
 - 4. Submit a detailed description of the proposed testing procedures to be used for this project. This description shall contain the name of the person responsible for testing equipment. Review of this description shall not be construed as an approval of any methods to be used; the Contractor shall be fully responsible for achieving the specified test results.

1.4 QUALITY ASSURANCE

- A. Inspect and test at foundry according to applicable standard specifications.
- B. Owner reserves right to inspect and test by independent service at manufacturer's plant or elsewhere at their own expense.

C. Visually inspect and hammer test before installation.

1.5 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs 60,000 PSI Tensile Strength.

B. American Water Works Association (AWWA)

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pressure Pipe and Fittings
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings for Water
4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges
6. AWWA C150 - Thickness Design of Ductile-Iron Pipe
7. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids
8. AWWA C153 - Ductile-Iron Compact Fittings, 3-in through 48-in for Water and Other Liquids
9. AWWA C219 - Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe
10. AWWA C600 - Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

A. American National Standards Institute (ANSI)

1. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Ductile iron pipe shall be that of a manufacturer who can demonstrate at least 5 years of successful experience in manufacturing ductile iron pipe. The pipe shall be equipped with push-on type, restrained joint, or mechanical joint, as required.
- B. Ductile iron pipe shall conform to the latest edition of AWWA C150 and C151, Class 52. Ductile iron pipe shall be McWane, US Pipe, or approved equal.
- C. Outside Coating: All pipe and fittings shall have a bituminous outside coating in accordance with AWWA C151 and C110, respectively, latest edition.
- D. Gaskets shall meet the material requirements of ANSI/AWWA C111 for mechanical joint gaskets.
- E. Fittings shall be compact ductile iron Class 350 Mechanical Joint, conforming to ANSI Specification A21.53 (AWWA C153), latest edition. Fittings shall be suitable for use with restraints as specified hereinafter. Fittings shall be made of the same material and have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or fraction of the circle on all bends. Fittings shall be Tyler Union AWWA C153 Compact Fittings, or approved equal.
- F. Joints for pipe and fittings shall be push-on or mechanical joints conforming to AWWA C111, latest edition.
- G. Restraint joints shall be furnished for thrust restraint for installation on all fittings and valves, where indicated on the drawings, or where required by the Engineer. Restraints for mechanical joints shall be Series 2100 Megalug as manufactured by EBAA Iron, or approved equal.
- H. Polyethylene shall be 8-millimeters thick and comply with AWWA C105, latest edition. Polyethylene encasement shall be “V-Bio” enhanced polyethylene encasement as manufactured by the ductile-iron pipe research association (DIPRA), or approved equal.

PART 3 – EXECUTION

3.1 HANDLING PIPE

- A. The Contractor shall take care not to damage pipe by impact, bending, compression, or abrasion during handling, and installation. Joint ends of pipe shall be kept especially clean.

- B. Pipe shall be stored above ground at a height no greater than 5 feet, and with even support for the pipe barrel.
- C. Only nylon-protected slings shall be used for handling the pipe. No hooks, chains or bare cables will be permitted.
- D. Gaskets shall be shipped in cartons and stored in a clean area, away from grease, oil, heat, direct sunlight and ozone producing electric motors.

3.2 LAYING DUCTILE IRON PIPE AND FITTINGS

- A. The Contractor will be responsible for transporting materials to the job site as needed. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe, lining or coatings. Pipe or fittings shall not be dropped. The engineer shall examine all pipes and fittings prior to installation. Any pipe or fittings found defective shall not be installed and immediately removed from the site. Any damage to pipe linings or coatings may be repaired as directed by the Engineer, or removed from the site. Handling and installation of pipe and fittings shall be in accordance with the manufacturer's instruction and as specified herein. Any materials damaged during loading, transporting or unloading shall be replaced at the Contractor's expense.
- B. Jointing of ductile iron pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. All pipe and fittings shall be thoroughly cleaned before laying; shall be kept clean until they are used in the work; and when installed, shall conform to the lines and grades required. Special care is required in cleaning the ends of the pipe; wipe the outside of the spigot end with a clean rag prior to applying lubricant; brush clean the inside of the bell end, paying special attention to the rubber joint area, prior to installing the gasket and lubricant; and check inside the pipe for overall cleanliness.
- C. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA C600, latest edition, except as otherwise provided herein. The joint surfaces and the gasket shall be painted with a lubricant just prior to making up the joint. The spigot end shall then be gently pushed home into the bell. The position of the gasket shall be checked to insure that the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint. A firm, even bearing throughout the length of the pipe shall be constructed by tamping selected common fill along the sides of the pipe forming a cradle under the pipe. Tamping shall continue until the fill is 1-foot over the top of the pipe. A 4.5-foot minimum cover shall be maintained over the top of the pipe. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at their own expense.
- D. All pipe shall be sound and clean before laying. During pipe installation, care should be taken to protect the open end of the pipe. When installation is not in progress,

including lunch time, the open ends of the pipe shall be closed with watertight plugs or other approved means. Good alignment shall be preserved during installation. Fittings, in addition to those shown on the Drawings, shall be provided, when required, for crossing utilities which are encountered during trench excavation. Solid sleeves shall be used only where approved by the Engineer.

- E. When pipe cutting is required, cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be jointed with a bell shall be beveled to conform to the manufactured spigot end. Ceramic epoxy lining shall remain undamaged.
- F. Existing Utilities: To the extent possible, the Contractor shall maintain a minimum 10 ft. lateral separation between the new water mains and existing sanitary sewers, unless otherwise directed by the Engineer.
- G. The Contractor shall maintain an 18-inch clearance between the bottom of the water main and crown of the sanitary sewer. The engineer may direct this full length of main to be concrete encased when the 18-inch clearance is not possible, or when the water main is placed below the sanitary sewer.
- H. Ductile iron pipe installed within 3 feet of gas lines shall be fully encased with polyethylene material.
- I. Ductile iron pipe shall be wrapped in polyethylene encasement where pipe depth is at or below normal ground/tide water level, in accordance with the Drawings.

3.3 JOINTS – GENERAL COMMENTS

- A. All joints shall be made watertight.
- B. Pipe shall be jointed in strict accordance with the pipe manufacturer's instruction. Jointing of all pipes shall be done entirely in the trench.

3.4 PUSH-ON JOINTS

- A. Push-on joints shall be made in accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. Apply thin film of nontoxic gasket lubricant over inner surface of gasket in contact with spigot end. The plain end of the pipe being installed shall be aligned and inserted into the bell end of the pipe previously installed. It can then be pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

3.5 MECHANICAL JOINTS

- A. Mechanical joints shall be made in accordance with Appendix A of AWWA C111 and the manufacturer's instructions. Wire brush surfaces to be in contact with the gasket and thoroughly clean and lubricate the joint surfaces and rubber gasket with soapy water before assembly. Check that the gasket has been seated in fitting before placing flange against gasket. With bolts inserted and nuts finger-tight, tighten diametrically opposite nuts progressively and uniformly around joint with a torque wrench. Bolts shall all be tightened to the specified torque. When using pneumatic or electric impact wrenches to make up fittings, complete tightening using a torque wrench to the specified torque. Under no conditions shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.

3.6 RESTRAINED JOINTS

- A. Mechanical joint restraints shall be installed in full accordance with the manufacturer's instructions. All bolt heads on Megalug restraints shall be tightened sufficiently so that they shear off to indicate the proper tightening torque was achieved.
- B. Push-on joint restraints shall be installed in full accordance with the manufacturer's instructions where directed by the Engineer.

3.7 TESTING

- A. Prior to pressure and leakage tests, the piping shall be thoroughly flushed clean of all dirt, dust, oil, grease and other foreign materials. This work shall be done with care to avoid damage to lining and coatings.
- B. The Contractor shall submit a plan on the method of testing the sewer force main for review to the Engineer. The plan shall include all equipment proposed for use during the work, or the name of the qualified testing company, which will perform the work. Testing of the sewer force main shall not begin until the Engineer has approved the Contractor's plan. All testing shall be done in the presence of the Engineer.
- C. Testing of Sewer Force Main:
 - 1. Refer to Section 02570 for testing requirements.

END OF SECTION 02616

SECTION 02640

VALVES AND APPURTENANCES

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The work covered under this section includes the furnishing of all plant, labor, equipment, appurtenances and materials, and in performing all operations in connection with installing and testing of the buried valves and appurtenances, at the locations indicated and/or as directed, complete in place in accordance with the drawings and specifications.
- B. Where existing gate boxes and valves are to be removed, the contractor is responsible for disposal.

1.2 RELATED WORK

- A. Section 02570 – Sewers, Structures and Appurtenances
- B. Section 02616 – Ductile Iron Pipe and Fittings for Buried Sewer Force Main

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings and descriptive literature, showing valve dimensions and other details for each type and class of valve to be furnished.

1.4 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - 1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 2. AWWA C500 - Gate Valves for Water and Sewerage System.
- B. Underwriters Laboratory (UL)
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 – PRODUCTS

2.1 MATERIALS

VALVES AND APPURTENANCES 02640-1

- A. Gate valves for force mains and cleanouts shall be ductile iron solid wedge gate valves made in accordance with AWWA Specification C-500 or Resilient-seated gate valves made in accordance with AWWA Specification C-509. Valves to be rated for 125 psi working pressure. Valve body and bonnet to be coated inside and out with fusion bonded epoxy. All interior coatings shall be suitable for wastewater.
- B. Valves are to have O-ring seals and a non-rising stem. Valves shall have a 2-inch operating nut, and be Open Left (counter-clockwise to open). An arrow indicating the opening position shall be cast into the operating nut.
- C. Valve boxes shall be cast iron, asphalt coated, sliding type, adjustable, together with cast iron covers with the word "SEWER" plainly cast in relief on the top surface. A minimum 6-inch overlap is required between sliding sections. The inside diameter of the bottom section shall be at least 5-1/4-inches and shall have a belled base. The top section shall be at least 6-1/8-inches and have top flanges. The bottom section shall be at least 36-inches in length. The top section shall be at least 26-inches in length and have a plain bottom.

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION

- A. All valves and appurtenances shall be installed in the location shown on the drawings or where directed by the Engineer. Valves shall be true to alignment and rigidly supported. Any damaged items shall be replaced before they are installed.
- B. During installation of all valves and appurtenances, the Contractor shall verify that all the items are clean, free from defects in materials and workmanship and functioning properly. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced.
- C. All valves shall be closed and kept closed until otherwise directed by the Engineer.
- D. Care shall be taken to avoid freezing of water in valves.

3.3 MANUFACTURER'S SERVICE

- A. The Contractor shall coordinate the services of a qualified representative of the tapping equipment and/or tapping valve supplier to provide on-site support and assistance during wet tapping operations of existing force mains.

3.4 SHOP PAINTING VALVES AND APPURTENANCES

- A. Interior and exterior surfaces of all valves which are not factory epoxy coated shall be given two coats of shop finish of an asphalt varnish conforming to the latest edition of

AWWA C504 for Varnish Asphalt. The pipe connection openings shall be capped to prevent the entry of foreign matter prior to application.

3.5 THRUST BLOCKS

- A. Concrete thrust blocks shall be placed between the bottom of tees and/or wyes and undisturbed soil at the bottom of the trench. Minimum bearing area shall be 36 square inches. Felt roofing paper shall be placed around the tee before placing concrete.

3.6 FIELD TESTS AND ADJUSTMENTS

- A. Conduct a functional field test of each valve, including actuators and valve control equipment, if any, in the presence of the Engineer to demonstrate that each part and all components together function correctly. The Contractor shall provide all testing equipment.

3.7 INSTALLATION OF BURIED VALVES AND VALVE BOXES

- A. The Contractor shall furnish all necessary labor and equipment to excavate and expose the force main sufficiently to install valves and/or tapping valves as required by the Engineer.
- B. Valves shall be cleaned and manually operated before installation. Valves shall be set on a firm foundation and supported by tamping pipe-bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with the finished grade. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. The valve box shall be set so as not to transmit loads to the valve.
- C. Before backfilling, all exposed portions of any bolts shall be coated with two coats of bituminous paint comparable to Bitumastic No. 50 by Koppers Co., Inc. or equal.

END OF SECTION 02640

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VALVES AND APPURTENANCES
02640-4

SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to do the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings.
- B. When applicable the Contractor shall perform the work in accordance with other sections of this Specification. When no applicable specification exists, the Contractor shall perform the work in accordance with the best modern practice and/or as directed by the Engineer.
- C. The work of this Section includes, but is not limited to, the following:
 - 1. Installing and maintaining construction warning and funding agency signs;
 - 2. Crossing and relocating existing utilities;
 - 3. Restoring of driveways and sidewalks;
 - 4. Cleaning up;
 - 5. Incidental work;
 - 6. Job photographs, if required;
 - 7. Protection and/or removal and reinstallation of existing signs, lampposts, fence posts, fencing and mailboxes;
 - 8. Protection and bracing of utility poles;
 - 9. Restoration and replacement of curbing; and
 - 10. Raking and re-seeding of grassed areas disturbed during construction and/or dewatering activities, including silt basin/dewatering activity areas.

MISCELLANEOUS WORK AND CLEANUP
02901-1

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, the Contractor may re-use existing materials that are removed.

PART 3 – EXECUTION

3.1 INSTALLING AND MAINTAINING CONSTRUCTION WARNING SIGNS

- A. Construction work zone traffic control shall be the contractor's responsibility. Generally, conformance with Part VI of the Manual of Uniform Traffic Control Devices (MUTCD), latest edition, "Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations", will be considered to meet this requirement.

3.2 CROSSING AND RELOCATING EXISTING UTILITIES

- A. In locations where existing utilities; including but not limited to culverts, water courses, including brooks and drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities; cannot be crossed without interfering with the construction of the work as shown on the Drawings, the Contractor shall remove and relocate the utility as directed by the Engineer or cooperate with the Utility Companies concerned if they relocate their own utility.
- B. Notification of Utility Companies shall be required prior to work being done, as specified in Section 01046 – Control of Work.
- C. At pipe crossings and where designated by the Engineer, the Contractor shall furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed.

3.3 RESTORING OF DRIVEWAYS AND SIDEWALKS

- A. Existing public and private driveways disturbed by the construction shall be replaced. Paved drives shall be repaved to the limits and thickness existing prior to construction. Gravel drives shall be replaced and regraded.
- B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension.

MISCELLANEOUS WORK AND CLEANUP 02901-2

3.4 CLEANING UP

- A. The Contractor shall remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall restore the site of the work to a neat and orderly condition.
- B. All loose and extraneous material, including but not limited to water, sand, concrete, and general debris, in manholes and catch basins shall be removed.
- C. Haybales and silt fences and any silt and debris retained by same shall be removed.
- D. Sweep clean all interior spaces.

3.5 INCIDENTAL WORK

- A. Do all incidental work not otherwise specified, but obviously necessary to the proper completion of the Contract as specified and as shown on the Drawings.

3.6 PHOTOGRAPHS OF PROJECT

- A. Prior to the excavation in any street or cross country area, the Contractor may document existing conditions using construction photographs. Photographs for this purpose shall be at the Contractor's expense.

3.6 RESTORATION AND REPLACEMENT OF SIGNS, LAMPPOSTS, FENCE POSTS, FENCING AND MAILBOXES

- A. Existing signs, lamp posts, fence posts, fencing and mailboxes which may be damaged by the Contractor or removed by the Contractor during the course of construction shall be reinstalled in a vertical position at the same location from which they were removed. Damaged items shall be replaced with an item equal to or better than the damaged items. A concrete anchor shall be provided as necessary, at no additional cost, to ensure a rigid alignment. Care shall be exercised in the reinstallation of all items to prevent damage to the new construction.

3.7 PROTECTION AND BRACING OF UTILITY POLES

- A. The Contractor shall be responsible for making all arrangements with the proper utility companies for the bracing and protection of all utility poles that may be damaged or endangered by the Contractors operations. Work under this item shall include the related removal and reinstallation of guy wires, or support poles whether shown on the Drawings or not.

3.8 RESTORATION AND REPLACEMENT OF CURBING

- A. Existing concrete, bituminous timber or granite curbing shall be protected. If

MISCELLANEOUS WORK AND CLEANUP
02901-3

necessary, curbing shall be removed and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension at the Contractor's expense. Granite curbing removed and reset shall conform to Section 580 of the Massachusetts Highway Department Standard Specifications. Joints between sections shall be pointed as required after resetting. Bituminous berms shall conform to Section 501 of the Massachusetts Highway Department Standard Specifications.

3.8 RAKING AND RE-SEEDING

- A. Grass and landscaped areas disturbed by the Contractor shall be raked and replenished with loam if required. Place topsoil to a depth in accordance with Section 02920 – Topsoil for areas disturbed by Contractor's construction operations. Spread evenly and grade to existing elevations and slopes. Hand rake areas inaccessible to machine grading. Use all available on-site stockpiled topsoil and supplement with off-site topsoil as required.
- B. Areas shall be re-seeded as directed by the Engineer. Seed mixture shall be in accordance with Section 02945 – Turf.

END OF SECTION 02901

MISCELLANEOUS WORK AND CLEANUP
02901-4

SECTION 02920

TOPSOIL

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this section consists of manufacturing, delivering, and placing 6" of topsoil on prepared subgrade areas disturbed by construction. Topsoil, as available, may be stripped, screened, stockpiled and tested for reuse. Topsoil requirements in excess of available on-site will be imported. Both sources will be placed in compliance with this section.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS and other DIVISION 1 Specification Sections, apply to this section. Related Sections include the following:
 - 1. Section 02200 – Earthwork
 - 2. Section 02945 – Turf

1.3 SUBMITTALS

- A. In accordance with Section 01300 – Submittals: Submit soil analysis report for imported topsoil from the State University Agricultural Extension Service or other approved soil testing laboratory. Report shall cover soil textural classification (percentages of sand, silt, and clay) and include additive recommendations for lawn areas. Field methods of analysis are acceptable, but laboratory report is preferred.

1.4 PRODUCT HANDLING

- A. Do not deliver topsoil in frozen, wet, or muddy condition.

PART 2 - MATERIALS

2.1 IMPORTED TOPSOIL

- A. Friable loam, typical of fertile local topsoil; free-from pure clay, weeds, noxious weed seeds, sod, clods and stones larger than 1 inch, toxic substances, litter, or other deleterious material; having a mildly alkaline to medium acid pH between 6.0 and 7.5. Soluble salts shall not exceed 4 milli-mhos per centimeter.

TOPSOIL
02920-1

- B. Soil Texture: 20 to 40% fines (silt and clay fraction passing the 200 sieve) and 60 to 80% sand and gravel. The maximum particle size shall be 1-inch.
- C. Organic Content: 5 to 10%
- D. Additives: As required by soil analysis of Topsoil for lawn areas.

PART 3 - EXECUTION

3.1 PLACING TOPSOIL

- A. Scarify compacted subgrade to a 2-inch depth to bond topsoil to subsoil. Place topsoil to a minimum depth of 6 inches for outside disturbed areas. Spread evenly and grade to existing elevations and slopes. Hand rake areas inaccessible to machine grading. Use all available on-site stockpiled topsoil and supplement with off-site topsoil as required, including amendments.

END OF SECTION 02920

TOPSOIL
02920-2

SECTION

02945 TURF

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all lawn installation and fine grading work and related items as indicated on the Contract Documents and/or as specified in this Section and includes, but is not necessarily limited to, the following:
 - 1. Seeding
 - 2. Maintenance and protection

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS and other DIVISION 1 Specification Sections, apply to this section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.
- C. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Section 02920 – Topsoil

1.3 SUBMITTALS

- A. At least 90 days prior to the first day of the seeding season described in this Section, submit to the Engineer proof of certification of Foreman or Crew Leader as Massachusetts Certified Landscape Professional or Massachusetts Certified Horticulturist in accordance with QUALITY ASSURANCE paragraph of this Section.
- B. Submit proof of landscape contractor's experience to the Engineer in accordance with QUALITY ASSURANCE paragraph of this Section.
- C. At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval. Do not order materials until Engineer's approval of samples, certifications or test results has been obtained. Delivered

TURF
02945-1

materials shall closely match the approved samples. Acceptance shall not constitute final acceptance. The Engineer reserves the right to reject on or after delivery any material that does not meet these Specifications.

1. Material Sampling and Testing of Loam Borrow from On-Site or Off-Site Sources shall be as specified in Section 2920 – TOPSOIL (Outside Disturbed Areas).
 2. Fertilizer:
 - a. Submit product literature of seeding fertilizer and certificates showing composition and analysis.
 - b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.
 3. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
 4. Hydroseeding: Prior to the start of hydroseeding, submit a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water.
 5. Wood Cellulose Fiber Mulch: Submit 4 copies of manufacturer's literature and one material sample.
 6. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
 7. All additives needed to amend a specific soil in order to meet these specifications.
- D. Maintenance Instructions: At the time of Acceptance, the Contractor shall submit complete maintenance instructions for turf care for the Owner's use. The instructions shall be reviewed for approval by the Engineer as a pre-condition for Acceptance.

1.4 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading, or drainage problems shall be reported to the Engineer prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section.

TURF
02945-2

- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

1.5 QUALITY ASSURANCE

- A. Qualification of Landscape Contractor: The work shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per SUBMITTALS.
- B. Qualification of Foreman or Crew Leader: All work of seeding shall be supervised by a foreman or crew leader who is a certified landscape professional or a certified horticulturist.
 - 1. Landscape professional shall be a Massachusetts Certified Landscape Professional certified by the Associated Landscape Contractors of Massachusetts.
 - 2. Horticulturist shall be a Massachusetts Certified Horticulturist as certified by the Massachusetts Nursery and Landscape Association.
 - 3. Certification shall be current. Proof of certification shall be submitted per SUBMITTALS.
- C. The ratio of laborers to certified landscape professionals or certified horticulturist shall not exceed twelve to one. Certified Landscape Professional or Certified Horticulturist shall be on the project site throughout the day to day performance of the work described in this Section.

PART 2 - PRODUCTS

2.1 LOAM

- A. As specified in Section 02920 – Topsoil.

2.2 SOIL ADDITIVES

- A. As specified in Section 02920 – Topsoil, except for additional applications of fertilizer that shall be specified under this Section based upon recommendations from soil analysis and testing as specified.

2.3 SEED

- A. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new,

TURF
02945-3

clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. Tall fescue and rygrass shall contain Acromonium endophytes. Seed containing endophyte must be kept cool and dry at all times; do not stockpile in the sun.

1. Seed Mixture Composition for disturbed areas:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>Germination Minimum</u>	<u>Purity Minimu</u>
Tall Fescue (3 varieties minimum)	80%	85%	95%
Kentucky Bluegrass	10%	85%	95%
Perennial Rye	10%	90%	95%

- a. All grass varieties shall be within the top 50 percent of varieties tested in National Turfgrass Evaluation Program, or currently recommended as low maintenance varieties by University of Massachusetts or the University of Rhode Island.
- b. Seeding rate shall be 6 pounds per 1,000 square feet.

B. Seed may be mixed by an approved method on the site or may be mixed by a dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers that shall bear the dealer's guaranteed analysis. If seed is mixed by a dealer then the Contractor shall furnish the Engineer the dealer's guaranteed statement of the composition of the mixture.

2.4 JUTE MESH

A. Jute mesh shall be a uniform, open, plain weave cloth of undyed and unbleached single jute yarn. The yarn shall be of a loosely twisted construction and it shall not vary in thickness more than one-half its normal diameter. Jute mesh shall be furnished in rolled strips and shall meet the following requirements:

- 1. Width - 48 inches, plus or minus one inch 78 warp - ends per width of cloth (minimum) 41 weft - ends per yard (minimum) Weight shall average 1.22 pounds per linear yard with a tolerance of plus or minus 5%.

B. Staples shall be U-shaped and shall be approximately six inches long and one inch wide. Machine made staples shall be of No. 11 gauge or heavier steel wire. Handmade staples shall be made from 12-inch lengths of No. 9 gauge or heavier steel wire.

C. Jute mesh shall be placed within 48 hours after finish grading or topsoiling of an

area is completed. If seeding is specified, within 24 hours after seeding of an area is completed. The jute mesh shall be placed in a manner that will minimize disturbance of the underlying soil. All equipment and application processes shall be approved by the ENGINEER prior to use.

- D. The surface shall be smoothed and all gullies and potholes backfilled prior to applying jute mesh. All rocks or clods larger than two inches in size and all sticks and other foreign material that will prevent contact of the jute mesh with the surface shall be removed. If the surface is extremely dry, the Engineer may require watering prior to placement.
- E. Jute mesh shall be placed uniformly, in contact with the underlying soil, at the locations shown on the Drawings or directed by the Engineer. The top edge of each strip shall be anchored by placing a tight fold of mesh vertically in a six inch deep slot or trench in the soil and tamping and stapling in place. Edges of adjacent strips shall be lapped six inches with a row of staples at a maximum interval of three feet in the lapped area. Bottom edges shall be lapped 12 inches over the next lower strip, if applicable, or buried as specified for top edges.
- F. Check slots shall consist of separate four foot strips of jute mesh placed at right angles to the direction of water flow immediately prior to placing the general covering of jute mesh. Check slots shall be anchored by burying the top edge of the strip as described above.
- G. Check slots shall be spaced so that one check slot, or junction slot of the jute mesh occurs every 75 feet on gradients of less than 4% and every 50 feet on gradients of more than four percent. On slope drains, a check slot or an end slot shall occur every 25 feet unless otherwise specified.
- H. Edges of jute mesh shall be buried around the edges of catch basins and other structures.
- I. Jute mesh shall be held in place by wire staples driven vertically into the soil. The mesh shall be fastened at intervals not more than three feet apart in three rows for each strip of mesh, with one row along each edge and one row alternately spaced in the middle. All ends of the mesh and check slots shall be fastened at six inch intervals across their width.
- J. The Contractor shall maintain the areas covered by jute mesh until final acceptance of the project. Prior to final acceptance, any damaged areas shall be reshaped as necessary, reseeded, if applicable; and the jute mesh satisfactorily repaired or replaced.

2.5 FERTILIZERS

- A. Fertilizer shall be a commercial product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers that

TURF
02945-5

shall bear the manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis specified in Section 02920 – TOPSOIL.

2.6 LIMESTONE

- A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. The Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.

2.7 WOOD CELLULOSE FIBER MULCH

- A. Mulch to cover hydroseeded areas with slopes less than 3 to 1 shall be fiber processed from whole wood chips and clean recycled newsprint in a 1:1 proportion manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.
- B. Moisture content shall not exceed 10 percent, plus or minus 3 percent as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams water per 100 grams fiber.
- C. The mulch shall be of such character that the fiber will be dispersed into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.
- D. The mulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be non-injurious to plant growth.

2.8 HERBICIDES, CHEMICALS AND INSECTICIDES

- A. Provide chemicals and insecticides as needed for fungus or pest control. All chemicals and insecticides shall be approved by the Massachusetts Department of Food and Agriculture for the intended uses and application rates.
- B. Provide post-emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn free of crab grass.

2.9 WATER

- A. The Contractor may use water provided by the Town upon request and approval of the DPW, if available. The Contractor shall be responsible to furnish his own supply of water to the site at no additional cost to the Owner. If Town water is not available, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water or use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from

TURF
02945-6

impurities injurious to vegetation. The Contractor's use of Owner's water shall be at his own risk.

PART 3 - EXECUTION

3.1 FILLING AND COMPACTION

- A. As specified in Section 02920 – TOPSOIL.

3.2 FINE GRADING

- A. As specified in Section 02220 – EARTHWORK.

3.3 SEEDING

- A. Contractor shall obtain Engineer's written approval of fine grading and bed preparation before doing any seeding.
- B. Limit of proposed grading shall be limit of seeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.
- C. The season for seeding shall be from April 1 to May 31 and from August 15 to September 30. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5 Days of spreading the loam.
- D. Seed only when the bed is in a friable condition, not muddy or hard.
- E. Seeding of Disturbed areas shall be by Hydroseeding Method specified as follows:
 - 1. Prior to the start of work, furnish a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding that can be covered with the quantity of solution in the hydroseeder.
 - 2. Hydroseed with wood cellulose fiber mulch at a rate as designated above in Part 2 – PRODUCTS.
 - 3. For the hydroseeding process, a mobile tank with a capacity of at least 500 gallons shall be filled with water and the mixture noted above in the specified proportions. The resulting slurry shall be thoroughly mixed by means of positive agitation in the tank. Apply the slurry by a centrifugal

TURF
02945-7

pump using the hose application techniques from the mobile tank. Only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed beds. The hose shall be equipped with a nozzle of a proper design to ensure even distribution of the hydroseeding slurry over the area to be hydroseeded and shall be operated by a person thoroughly familiar with this type of seeding operation.

4. Contractor shall obtain Engineer's written approval of fine grading and bed preparation before doing any hydroseeding.
5. Limit of work shall be limit of hydroseeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of hydroseeding shall be hydroseeded.
6. Seed only when the bed is in a friable condition, not muddy or hard. Construction methods shall conform to hydraulic method requirements specified in the Standard Specification.
7. Hydroseeding shall be a two-step process.
 - a. Step one shall consist of spreading 100 percent of the required seed uniformly over the prepared loam bed so that the seed comes into direct contact with the soil. To mark the progress of the hydroseeding operation the Contractor may add 10 percent of the wood cellulose fiber mulch to the slurry.
 - b. Step two shall consist of a separate application of wood cellulose fiber mulch immediately following the first step of hydroseeding noted above. Apply the wood cellulose fiber mulch at a rate of 2,000 pounds per acre.

3.4 TURF MAINTENANCE

- A. Maintenance shall begin immediately after any area is seeded or sodded and shall continue for a 60 day active growing period for seeded areas or until Final Acceptance, whichever is longer following the completion of all lawn construction work, and until final acceptance of the project. In the event that seeding operations are completed too late in autumn for adequate germination and growth of grass, then maintenance shall continue into the following spring for the minimum 60 Day period and including the One (1) Year Maintenance Period.
- B. Maintenance shall include re-seeding, two (2) mowings, watering, weeding, fertilizing a minimum of two times in addition to the fertilizer incorporated by harrowing into the spread loam, and resetting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus and/or pest control.
- C. During the maintenance period, any decline in the condition of turf areas shall

TURF
02945-8

require immediate action to identify potential problems and to undertake corrective measures.

- D. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.
1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least two (2) inches for seeded areas and four (4) inches for sodded areas. At no time shall a tank truck be allowed on the reseeded/re-sodded beds.
 2. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply water to the required soil depths each 8-hour period.
- E. After the grass in seeded areas has germinated, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of grass with no less than 20 grass shoots per square inch and 2,880 grass shoots per square foot. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the Contractor's expense.
- F. Mowing and Edging:
1. The Contractor shall keep lawn areas mowed until Acceptance of the contract by cutting to a height of two (2) inches when growth reaches three (3) inches or as directed by the Engineer.
 2. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be edge trimmed by hand or machine to produce straight and uniform edge conditions.
 3. Remove and discard from paved areas only clippings and debris generated by each mowing and edging operation legally off-site. Engineer, if practical and aesthetic, may allow sweeping (not blowing) clippings back into grass. Mowers shall be equipped with mulching blades. Do not remove from grass areas any clippings that have been generated by mowing operations. Do not mow grass when wet.
- G. Fertilizing for seeded lawns: The first application of fertilizer is as specified in Section 02920 – Topsoil. A second application of fertilizer shall be applied to seeded areas at the time of the first mowing and shall be performed as specified

TURF
02945-9

herein. This second application shall be applied at a rate that ensures that one-half pound of nitrogen is applied per 1,000 square feet. Phosphorus and potassium shall be applied proportionally in accordance with the recommendations of the soil tests and the quantities previously integrated into the soil during the first application. A third application of nitrogen fertilizer shall be applied to seeded areas approximately two months after the second application. This third application shall correspond to the following application rates dependent upon the month of application.

1. May 1-15: Apply 1.0 pound of nitrogen per 1,000 square feet.
2. June 15-30: Apply 1.0 pound of nitrogen per 1,000 square feet.
3. August 15 through September 15: Apply 1.0 pound of nitrogen per 1,000 square feet.
4. November 1-15: Apply 1.5 pounds of nitrogen per 1,000 square feet.

**Nitrogen fertilizer shall be composed of 50 percent slowly soluble or slow release nitrogen fertilizer.

3.5 APPLYING LIMESTONE

- A. The Contractor shall return to the site at the beginning of the next seeding season as specified above and spread limestone across all lawn areas installed under this Contract. Limestone shall be spread at rates determined by the soil tests specified.

3.6 ACCEPTANCE

- A. Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Engineer in writing for a formal inspection of the completed work. Request for inspection shall be received by the Engineer at least 10 Days before anticipated date of inspection.
- B. Acceptance Requirements:
 1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected.
- C. Furnish full and complete written instructions for maintenance of the lawns to the Owner at the time of acceptance in conformance with Submittals requirements.

TURF
02945-10

- D. Engineer's inspection shall determine whether maintenance shall continue in any part.

3.7 CLEAN UP

- A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Engineer, at no cost to the Owner.

END OF SECTION 02945

TURF
02945-11

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02945-12

DIVISION 3 – CONCRETE

<u>Section</u>	<u>Title</u>	<u>Page</u>
03300	Cast-In-Place Concrete	03300-1
03416	Precast Concrete Structures	03416-1
03500	Water Reactive Elastomeric Chemical Grout Injection	03500-1
03700	Modifications to Existing Concrete	03700-1

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section covers all concrete and all related items necessary to place and finish the concrete work.
- B. General: Submit in accordance with Condition of Contract and Division 1 – General Requirements Specification Section.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Concrete Institute (ACI)

ACI 301 Structural Concrete for Buildings

ACI 302 Recommended Practice for Concrete Floor and Slab Construction

ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete

ACI 304.2R Placing Concrete by Pumping Methods

ACI 305 Recommended Practice for Hot Weather Concreting

ACI 306 Recommended Practice for Cold Weather Concreting

ACI 308 Standard Practice for Curing Concrete

ACI 318 Building Code Requirements for Reinforced Concrete

American Society for Testing and Materials (ASTM)

ASTM C31 Making and Curing Concrete Test Specimen

ASTM C33 Concrete Aggregates

ASTM C39 Compressive Strength of Cylindrical Concrete Specimens

CAST-IN-PLACE CONCRETE

03300-1

ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

ASTM C94 Ready-Mixed Concrete

ASTM C143 Standard Method for Slumps of Portland Cement Concrete

ASTM C150 Portland Cement

ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260 Air-Entraining Admixtures for Concrete

ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C494 Chemical Admixtures for Concrete

- B. Where reference is made to one of the above standards, the revisions in effect at the time of bid opening shall apply.

1.3 SUBMITTALS

- A. General: Submit in accordance with Condition of Contract and Division 1 – General Requirements Specification Section.
- B. Six sets of shop drawings of the materials specified herein shall be submitted to the Engineer for review.
- C. Submit sources of cement and aggregates and their conformance to referenced standards.
- D. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.
- E. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
- F. Water reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
- G. Mid or high range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended

CAST-IN-PLACE CONCRETE 03300-2

dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.

- H. Sheet curing material. Product data including catalogue cut technical data and conformity to ASTM standard.
- I. Liquid curing compound. Product data including catalogue cut technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.
- J. Grout. Catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to specified standards.
- K. Submit concrete placing sequence to the Engineer for review and comment.
- L. Test Report
 - 1. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, type and manufacturer of cement.
 - a. Standard deviation data for each proposed concrete mix based on statistical records.
 - b. Water-cementitious materials ratio curve for concrete mixes based on laboratory test. Give average cylinder strength test results at 28 days for laboratory concrete mix designs. Provide results of 7 and 14 day tests if available.
- M. Certifications
 - 1. Certify that admixtures used in the same concrete mix are compatible with each other and the aggregates.
 - 2. Certify that the Contractor is not associated with the independent testing laboratory nor does the Contractor or its officers have a beneficial interest in the laboratory.
- N. Qualifications
 - 1. Independent testing laboratory: Name, address and qualifications. Laboratories affiliated with the Contractor or in which the Contractor or corporate officers have a beneficial interest are not acceptable.

CAST-IN-PLACE CONCRETE
03300-3

1.4 DELIVERY, STORAGE AND HANDLING

- A. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
- B. Grout: Non-shrink cement-based grouts shall be delivered as preblended, prepackaged mixes requiring only the addition of water.

1.5 QUALITY ASSURANCE

- A. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.
- B. Damages and imperfections shall be corrected by the Contractor to the satisfaction of the Engineer at no additional cost to the Owner.
- C. All field-testing and inspection services required shall be provided by the Owner. The cost of such work, except as specifically stated otherwise, shall be paid for by owner. Methods of testing shall comply in detailed with the latest applicable ASTM method.
- D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.
- E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at the Contractor's expense, make new acceptance tests of aggregates and establish new design mixes. Such testing and design shall be accomplished with the assistance of a certified independent testing laboratory, retained by the Contractor, acceptable to the Engineer.

1.6 DEFINITION

- A. Non-shrink grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base material surface.

PART 2 - PRODUCTS

2.1 CEMENT

- A. The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to ASTM C150. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award

CAST-IN-PLACE CONCRETE 03300-4

of contract. Only one color of cement, all of the same manufacture, shall be used for the work.

- B. When the use of Portland cement Type III is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

2.2 AGGREGATES

- A. Except as otherwise noted, aggregates shall conform to the requirements of ASTM C33.
- B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33 and the following additional requirements:

Sieve	Retained Percent
#4	0 to 5
#16	25 to 40
#50	70 to 87
#100	93 to 97
Fineness Modulus	2.80 (\pm 0.20)
Organic	Plate 2 maximum
Silt	2.0% maximum
Mortar Strength	100% minimum compression ratio
Soundness	5% maximum loss, magnesium sulfate, five cycles

- C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33 and the following additional requirements:

Designated Size (inches)	3	2	1-1/2	1	3/4	1/2	3/8
Fineness Modulus (\pm -0.20)	7.95	7.45	7.20	6.95	6.70	6.10	4.50
Organic	Plate 1 maximum						
Silt	1.0% maximum						
Soundness	5% maximum loss, magnesium sulfate, five cycles						

Grading requirements shall be as listed in ASTM C33, Table 2 for the size number corresponding to the appropriate maximum coarse aggregate size. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33, Table 3 for severe weathering regions. Size numbers for the concrete mixes shall be as shown in Table 03300-1.

CAST-IN-PLACE CONCRETE
03300-5

TABLE 03300-1

Description	Maximum Coarse Aggregate Size	Size Number (ASTM C33 Table 2)
24-in thick or greater	1-1/2-in	467
Greater than 12-in thick	1-in	57
12-in thick or less	3/4-in	67
Peastone mix	3/8-in	8

2.3 WATER

- A. Water shall be potable. Water for curing shall not contain any substance injurious to concrete, or which causes staining.

2.4 ADMIXTURES

- A. Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures.
1. Air entraining agent shall be in accordance with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
 2. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A, and contain no more than .05% chloride ions. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
 3. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.05% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time. The treated concrete shall be capable of maintaining plastic state for two hours or longer depending on application. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
 4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.
 5. Prohibited admixtures: Calcium chloride, thiocyanates and admixtures containing more than 0.05% chloride ions are not permitted.

2.5 MIXES

CAST-IN-PLACE CONCRETE
03300-6

- A. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor.
- B. Select properties of ingredients to meet the design strength and materials limits specified in Tables 03300-2 and 03300-3 and to produce concrete having proper placeability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.
- C. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if not available, be developed by laboratory test. Water content of the concrete shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing a average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the compressive strength specified, without extrapolation. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratios and net minimum cementitious content as specified in Table 03300-3.

TABLE 03300-2

Design Strength*	Minimum Lab Strength at 7 Days
3000 psi	2100 psi
4000 psi	2800 psi

*Specified compressive strength at 28 days

In no case, however, shall the resulting mix conflict with the limiting values for maximum water content and net minimum cement factor specified in Table 03300-3.

- D. The limiting strengths, cement factors and water contents for each mix shall be in accordance with Table 03300-3.

TABLE 03300-3

Minimum 28 Day Design Strength (psi)	Net Minimum Cement Factor* (100 lbs/cy)	Maximum Water Content** (gals/100 lbs of Cement)	Maximum Water-Cementitious Materials Ratio (by weight)
3000	6.11	6.4	0.58
4000	6.3	5.4	0.45
Pumped Concrete	6.3		0.45

CAST-IN-PLACE CONCRETE
03300-7

* Minimum. Increase as necessary to meet other requirements. These cement factors apply to “controlled” concrete subject to specific inspection.

** Maximum. Decrease if possible. This represents total water in mix at time of mixing, including free water on aggregates and water in admixture solutions.

- E. Compression Test: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the compression strength requirements in conformity with the provisions of ACI 318.
- F. Entrained air, as measured by ASTM C231, shall be as shown in Table 03300-4.

TABLE 0033-4

<u>Concrete Placement</u>	<u>Total Air Measured at Discharge From Truck (Percent)</u>
Trowel finished slabs	3.5 maximum
All other concrete	4-6

- 1. If the air entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal required under Paragraph 1.04.

- G. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 03300-5. If plasticizer is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a maximum slump of eight inches.

TABLE 03300-5

<u>Portion of Structure</u>	<u>Slump (inches)</u>	
	<u>Recommended</u>	<u>Range</u>
Pavement and slabs on ground	2	1-3
Plain footings, slabs, beams		
Pads, curbs and sludge tank walls	2-3	1-4
Heavy reinforced foundation		
Walls and footings	3-4	2-5
Thin reinforced wall and columns	4	3-5

- H. Proportion admixtures according to the manufacturer’s recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

2.6 CONCRETE

CAST-IN-PLACE CONCRETE 03300-8

- A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete fill and concrete used as fill under foundations (mud slab), and elsewhere approved by the Engineer, shall be the 3,000 psi mix.

CONCRETE STRENGTHS

Minimum Comp. Strength at 28 days (psi)	Maximum Water/ Cement Ratio Gallons per bag of cement)*	Cement Factor: 94 lb. bags Per cubic yard minimum**
3000	0.59 (6.9)	5.5
4000	0.48 (5.6)	6.5

- * Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.
- ** These are minimum amounts; increase as necessary to meet mix requirements
- B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.
- C. Standard compression tests in conformity with the provisions of ACI 318 of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.
- D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume, measured at discharge from truck, of 3 to 6 percent for 1-1/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.
- E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.
- F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8 inches. Any concrete having a slump greater than 4 inches (8 inches with superplasticizer) shall be promptly removed from the site.

CAST-IN-PLACE CONCRETE
03300-9

- G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.
- H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.7 GROUT

- A. Non-metallic, non-shrink grout shall be pre-mixed, non metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensation agents, plasticizing and water reducing agents, complying with CRD-C588.

2.8 CURING MATERIALS

- A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309 Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil.

2.9 FLOOR HARDENER

- A. Floor hardener shall be a colorless aqueous solution containing zinc silicofluoride, magnesium silicofluoride, or sodium silicofluoride. These silicofluoride can be used individually or in combination. Proprietary hardeners may be used if approved by the contracting officer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Under no circumstances shall concrete which has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.
- B. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his readiness to proceed at least six working hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

CAST-IN-PLACE CONCRETE 03300-10

- C. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:
 - 1. The gradation of aggregate
 - 2. The proportion of fine and coarse aggregate.
 - 3. The percentage of entrained air, within the allowable limits.
- D. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any wage is added and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of transit mix trucks.

3.2 PREPARATION

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.
- B. Earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.
- C. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping, roughen to a ¼ inch amplitude, and washing off all dirt, scum and laitance. It then shall be moistened prior to placing new concrete.

3.3 MIXING AND TRANSPORTATION

- A. Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C94, except as otherwise specified. Truck mixers, agitators, and non-agitating units shall comply with National Ready-Mix Concrete Association (NRMCA) and Truck Mixer Manufacturers' Bureau (TMMB). Ready-mix plant equipment and facilities shall be certified in accordance with NMRCA QC 3. Site-mixed concrete shall be mixed in accordance with ACI 301. On-site plant shall conform to the NRMCA CPMB 100.

CAST-IN-PLACE CONCRETE 03300-11

- B. No water from the truck system or elsewhere shall be added after the initial introduction of mixing water for the batch except when on arrival at the jobsite, the slump of the concrete is less than that specified. Water added to bring the slump within the specified range shall not change the total water in the concrete to a point that the approved water-cement ratio is exceeded. The drum shall be turned an additional 30 revolutions, or more, if necessary, until the added water is uniformly mixed into the concrete. Water shall not be added to the batch at any later time.
- C. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the name plate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.
- D. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.
- E. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
- F. Concrete shall be discharged within 1-1/2 hours after introduction of the cement to the aggregates, except that when the concrete temperature exceeds 85 degrees F, this time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the truck.
- G. Temperature and Mixing Time Control:
 - 1. In cold weather, maintain the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms as indicated in Table 03300-6.
 - 2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.

CAST-IN-PLACE CONCRETE
03300-12

3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
4. The maximum time interval between the addition of mixing water and/or cement to the batch, and the placing of concrete in the forms shall not exceed the following:

TABLE 03300-6

AIR OR CONCRETE TEMPERATURE (WHICHEVER IS HIGHER)	MAXIMUM TIME
80 degrees F to 90 degrees F	45 minutes
70 degrees F to 79 degrees F	60 minutes
40 degrees F to 69 degrees F	90 minutes

If an approved mid or high range water reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes or other appropriate time such that workability and Contractor's ability to properly place the concrete will not be adversely compromised.

3.4 INSTALLATION/APPLICATION/ERECTION

A. PLACING:

1. Verify that all formwork completely encloses concrete to be poured and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from form. Confirm that reinforcement and other embedded items are securely in place.
2. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.
3. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.
4. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the

CAST-IN-PLACE CONCRETE
03300-13

proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.

5. Do not place concrete for supported elements until concrete previously placed in the supporting element (column, slabs and/or walls) has reached 70% of its 28 day strength.
6. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.
7. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.
8. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.
9. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.
10. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.

CAST-IN-PLACE CONCRETE
03300-14

11. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.
12. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

B. CONCRETE PLACING DURING COLD WEATHER

1. For this Specification, cold weather is defined as a period when for more than three successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.
2. Concrete placed during cold weather shall be batched, delivered, placed, cured and protected to compliance with the recommendations of ACI 306R and the additional requirements of this section.
3. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40oF, or is expected to fall to below 40 degrees F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.
4. The temperature of concrete surfaces shall not be permitted to drop below 50 degrees F. for at least 7 days after placement of the concrete.
5. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with provisions of ACI 306. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.

C. CONCRETE PLACING DURING HOT WEATHER

1. For this Specification, hot weather is defined as any combination of high air temperatures, low relative humidity, and wind velocity which produces a rate of evaporation as estimated in ACI 305R, approaching or exceeding 0.2 pounds per square foot per hour.
2. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold

CAST-IN-PLACE CONCRETE 03300-15

water. The Contractor shall make every effort to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

3. During periods of excessively hot weather (90 degrees F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90 degrees F, when ready for placement will not be acceptable, and will be rejected.
4. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.
5. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel
6. Temperature will not exceed the ambient air temperature immediately before embedment in concrete.
7. Wet form, particularly metal deck, before placing concrete.
8. Keep permanent temperature record showing date and outside temperature for concreting operations. Thermometer reading shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such periods shall likewise be recorded, in such manner as to show any effect temperatures may have had on construction. Copies of temperature record shall be distributed daily to Owner.

D. COMPACTING

1. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cu. yd. of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.

CAST-IN-PLACE CONCRETE 03300-16

2. A minimum frequency of 7000 revolutions per minute is required for mechanical vibrators. Do not use vibrators to transport concrete within forms. Insert vibrators and withdraw at points from 18-in to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from five to 15 seconds. Do not over vibrate so as to segregate.

E. CURING

1. Immediately after placement, concrete shall be protected from premature drying extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the placement prior to placing concrete. No fire or excessive heat shall be permitted near or in direct contact with the concrete at any time. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.
2. Curing procedure shall be continued for at least 7 days.
 - a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.
 - b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.
 - c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. FINISHING OF FORMED SURFACES

1. Schedule of Finishes:
 - a. Concrete for the Project shall be finished in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another Section.
 - b. Finishes to the base concrete for the following conditions shall be finished as noted and as further specified herein:
 - i. Exposed exterior formed concrete, except exposed slabs and walking surfaces – Rubbed finish.

CAST-IN-PLACE CONCRETE
03300-17

- ii. Concrete to receive chemical hardener – Light broom finish, non slip, except at electrical rooms provide wood float, non slip.
 - iii. Exterior concrete slab, stairs and other horizontal areas - Broomed finish, non-slip.
 - iv. Walls and vertical surfaces in process tanks and basins – Off form finish.
 - v. Concrete receiving sheet membrane waterproofing – cleared of laitance and foreign materials and rubbed at vertical surfaces, steel trowel finish at horizontal/sloping surfaces.
 - vi. Concrete to receive paint – Rubbed finish
 - vii. Top of curbs and pads – Steel troweled finish
2. Concrete shall not be stripped before the concrete has been cured and attained required strength.
 3. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or doing any other work adjacent thereto.
 4. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Engineer.
 5. Off-Form Finish – Fins and other projections shall be removed, dull of and sharpen edges, and tie cones and defects filled.
 6. Rubbed Finish
 - a. Immediately upon stripping forms and before concrete has changed in color, all fins shall be carefully removed with a hammer. While the wall is still damp apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat with all pits, air holes or blemishes in the parent concrete; avoid coating large areas of the finished surface with this slurry
 - b. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout consisting of one volume cement to 1-1/2 volumes of clean masonry sand having a fineness modulus of approximately 2.25 and complying with the gradation requirements of the ASTM for such a material. Grout shall be uniformly applied by means of camp (neither dripping wet nor dry) pads of coarse burlap approximately 6-in square used as a float. Grout shall be well scrubbed into the pits and air holes to provide a dense mortar in the imperfections to be patched.

CAST-IN-PLACE CONCRETE
03300-18

- c. Allow the mortar to partially harden for one or two hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the perpendicular edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed with a trowel. Grout allowed to remain on the wall to long will get too hard and will be difficult to remove.
- d. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout should remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cut with the trowel so it can be wiped off clean with the burlap.
- e. On the day following the repair of pits, air holes and blemishes, the walls again shall be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild-abrasive. After this treatment, there shall be no built-up firm remaining on the parent surface. If, however, such is present a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without working up a lather or mortar or change the texture of the concrete. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.
- f. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation in order that no extraneous materials remain on the surface of the wall. The wall shall be sprayed with a fine fog spray periodically to maintain a continually damp condition for at least 3 days after the application of the repair grout.
- g. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted, shall receive a smooth rubbed finish, in accordance with ACI 301 and as described below.
- h. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are

CAST-IN-PLACE CONCRETE
03300-19

complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.

G. TESTING

1. Concrete inspection and testing shall be performed by an independent inspection laboratory, engaged and paid for by the Contractor. The Engineer shall approve the inspection laboratory before concrete work commences. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.
2. At least one slump test shall be performed from each truck load of concrete. The sample for slump shall be taken from the middle third of a truck load. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.
3. The Contractor shall advise the Engineer of his readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.
4. A minimum of four standard compression test cylinders shall be made and tested for each 100 cubic yards or fraction thereof for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality.
5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f_c , and no individual strength test (average of two cylinders) result falls below the specified strength f_c by more than 500 psi.

CAST-IN-PLACE CONCRETE 03300-20

6. In the event the average compressive strength of the two 28 day cylinders does not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

H. FAILURE TO MEET REQUIREMENTS

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense.
2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.
3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.
4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.
5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefore, shall be at the expense of the Contractor.
6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

$$D \text{ equals } 0.001 (L \times L)/t$$

CAST-IN-PLACE CONCRETE 03300-21

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

END OF SECTION 03300

CAST-IN-PLACE CONCRETE
03300-22

SECTION 03416

PRECAST CONCRETE STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

- A. This section of the Specification covers all materials, labor, tools and equipment, and operations necessary to furnish and install the precast reinforced concrete tank and associated work, as shown on the Contract Drawings.
- B. The requirements for the precast reinforced concrete tanks, vary by manufacturer. Precast design shall be submitted for review by the Engineer.
- C. The precast reinforced concrete tank size shall be as shown on the Drawings with openings cast into the structure at the precast facility. Contractor is responsible for coordination of all opening locations/sizes.
- D. Work includes all excavation, dewatering, miscellaneous preparation, concrete tank installation, walls, base, grout, backfill, compaction and surface restoration.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section, and:
 - 1. Section 02200 – Earthwork
 - 2. Section 03300 – Cast-in-Place Concrete

1.3 SUBMITTALS

In addition to product data, submit design mixes for each concrete mix.

- A. Copies of shop and erection drawings shall be submitted for the Engineer's review. The drawings shall show all dimensions of precast sections; location openings; the locations, type, size and strength of inserts, embedded angles, steel reinforcement; and all other information necessary to ensure proper handling, fabrication, and erection of the tank.
- B. Copies of the tank design calculations stamped by a Massachusetts registered professional structural engineer shall be submitted to the Engineer for record purposes only.

PRECAST CONCRETE STRUCTURES

03416-1

- C. Anti-flotation Slab Design Certificate: Submit a certificate of design stamped by a Professional Engineer registered in the State in which the Work is being performed, certifying that the structure including anti-flotation slab has been designed to withstand all forces including soil, traffic and hydrostatic in accordance with all applicable laws, regulations, rules and codes. Assume groundwater is at surface elevation for anti-flotation calculations. Provide anti-flotation calculations with the certificate of design.

1.4 QUALITY ASSURANCE

- A. The Precaster shall demonstrate adherence to the standards set forth in the NPCA Quality Control Manual. The Precaster shall meet either Section 16.1 or 16.2.
- B. Certification: The Precaster shall be certified by the Precast/Prestressed Concrete Institute Plant Certification Program or the National Precast Concrete Association's Plant Certification Program prior to and during production of the products covered by this specification.
- C. Qualifications, Testing and Inspection
 - 1. The Precaster shall have been in the business of producing precast concrete products similar to those specified for a minimum of five years. He shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the Precaster to produce quality products consistent with industry standards.
 - 2. The Precaster shall show that the following tests are performed in accordance with the ASTM standards indicated. Tests shall be performed for each 150 cubic yards of concrete placed, but not less frequently than once per production run, as defined in §8 of these specifications.
 - a. Compressive Strength: C39, C497
 - b. Air Content: C231 or C173
 - 3. The Precaster shall provide documentation demonstrating compliance with this section to the Engineer at regular intervals or upon request.
 - 4. The Owner may place an inspector in the plant when the products covered by this specification are being manufactured.

1.5 DESIGN

- A. The precast element dimensions and reinforcement details shall be as prescribed in the Drawings and the shop drawings provided by the manufacturer, subject to the provisions herein. The minimum concrete compressive strength shall be as noted on the shop drawings. The minimum steel yield strength shall be 60,000 psi, unless otherwise noted on the shop drawings

PRECAST CONCRETE STRUCTURES 03416-2

- B. The precast elements shall be designed in accordance with the “Standard Specifications for Highway Bridges” 16th Edition, adopted by the American Association of State Highway and Transportation Officials, 1996, as amended by the 1997, 1998, 1999, and 2000 Interim Revisions.
- C. Placement of Reinforcement for Precast Tank - The cover of concrete over the longitudinal and transverse reinforcement shall be 2 inches minimum. The clear distance from the end of each precast element to the end transverse reinforcing steel shall not be less than one inch nor more than two inches. Reinforcement shall be assembled utilizing a single layer of welded wire fabric, or a single layer of deformed billet-steel bars. Welded wire fabric shall be composed of transverse and longitudinal wires meeting the spacing requirements of 6.7, below, and shall contain sufficient longitudinal wires extending through the element to maintain the shape and position of the reinforcement. Longitudinal reinforcement may be welded wire fabric or deformed billet-steel bars and shall meet the spacing requirements of 6.7, below. The ends of the longitudinal reinforcement shall be not more than 3 inches and not less than 1½ inches from the ends of the walls.

1.6 DESIGN CERTIFICATION

The tank shall be designed by a registered professional structural engineer and engineered to meet code requirements for Massachusetts and the Town of Tisbury, Massachusetts. The precast structure shall be furnished with design calculations and a letter of certification signed and sealed by a registered professional structural engineer stating the tank meets the design load requirements.

The precast tank shall be designed to meet the requirements of loading of the following:

- A. Standard Specifications for Highway Bridges, Latest Edition.
- B. American Concrete Institute (ACI-318R-05) “Building Code Requirements for Reinforced Concrete”.
- C. Concrete Reinforcing Institute “Manual of Standard Practice”.

1.7 PLANT CERTIFICATION

The plant shall be regularly engaged in the construction and erection of precast concrete units. The manufacturing plant shall be “National Precast Certified Plants”. The manufacturer shall be engaged in producing precast concrete units for a minimum of ten years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete

PRECAST CONCRETE STRUCTURES 03416-3

The concrete for the precast elements shall be air-entrained, when installed in areas subject to freeze-thaw conditions, composed of Portland cement, fine and coarse aggregates, admixtures, and water. Air-entrained concrete shall contain 6 ± 2 percent air, and the air-entraining admixture shall conform to AASHTO M154

1. Portland Cement - Shall conform to the requirements of ASTM Specifications C150-Type I, Type II, or Type III cement.
2. Coarse Aggregate – Shall consist of stone having a maximum size of 1 inch. Aggregate shall meet requirements for ASTM C33.
3. Water Reducing Admixture – The manufacturer may submit, for approval by the Engineer, a water-reducing admixture for the purpose of increasing workability and reducing the water requirement for the concrete.
4. Calcium Chloride – The addition to the mix of calcium chloride or admixtures containing calcium chloride will not be permitted.

B. Steel Reinforcement and Hardware

All reinforcing steel for the precast elements shall be fabricated and placed in accordance with the detailed shop drawings submitted by the manufacturer.

1. Steel Reinforcement - Reinforcement shall consist of welded wire fabric conforming to AASHTO M55 (ASTM A 185) or AASHTO M221 (ASTM A 497) or deformed billet steel bars conforming to AASHTO M31 (ASTM A 615) Grade 60. Longitudinal distribution reinforcement may consist of welded wire fabric or deformed billet-steel bars.
2. Hardware:
 - a. Bolts and threaded rods shall conform to ASTM A307. Nuts shall conform to AASHTO M292 (ASTM A194) Grade 2H. All bolts, threaded rods and nuts used shall be mechanically zinc coated in accordance with ASTM B 695 Class 50.
 - b. Structural Steel for plates and plate washers shall conform to AASHTO M270 (ASTM A709) Grade 36 and shall be hot dip galvanized as per AASHTO M 111 (ASTM A123).
 - c. Ferrule Loop Inserts shall be F-64 Ferrule Loop Inserts as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio.
 - d. Hook Bolts shall be ASTM A307. Inserts shall be AISI type 304 stainless steel, F-58 Expanded Coil inserts as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio. Coil rods and nuts shall be AISI type 304 stainless steel. Washers shall be either AISI type 304 stainless steel plate washers or AASHTO M 270 (ASTM A709) Grade 36 plate washers hot dip galvanized as per AASHTO M 111 (ASTM A153).

PRECAST CONCRETE STRUCTURES
03416-4

- e. Reinforcing bar splices shall be made using the Dowel Bar Splicer System as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio or approved equal, and shall consist of the Dowel Bar Splicer (DB-SAE) and Dowel-In (DI).

2.2 ACCESS HATCHES

- A. The unobstructed opening shall be sized to accommodate the clear insertion and removal of the selected pumping system or as shown on the Drawings, whichever is greater. Provide fall through protection in conformance with OSHA standard 1910.23.
- B. Hatches shall be H-20 rated by Halliday Projects, EJ Prescott, or approved equal equipped with a safety grate.
- C. All bars, angles and shapes shall be type 6061-T6 aluminum. The access cover frame shall be a minimum of 4-inches deep.
- D. The access door and safety grate shall be equipped with a hold-open arm, held open in the 90-degree position. Cover door hinges shall be heavy-duty design and be cast 1/4-inch thick Type 316 stainless steel stainless steel hinge pins. All fasteners shall be type-316 stainless steel.
- E. Each hatch shall be supplied with a type-316 stainless steel slam lock, having a key-way protected by a threaded plug. The plug shall be flush with the diamond plate cover. The hatch shall be equipped with an aluminum lift handle that shall be flush to the top of the diamond plate cover
- F. The access hatch units unit shall be equipped with a hinged safety grate. The grate material and hardware shall withstand corrosive environments. The closed safety grate shall be designed to support the weight of one pump or 300 pounds, whichever is greater.
- G. Secondary protective grating panel shall be minimum 3 inch (77mm) thick aluminum "I" bar grating.
- H. Secondary protective grating panel shall be 3 inch (77mm) thick aluminum "I" bar grating. Coating shall be Safety Orange.
- I. Grating panel shall be hinged with tamper proof stainless steel bolts, and shall be supplied with positive latch to maintain unit in an upright position.
- J. A padlock hasp and padlock keyed to the Owner's key set shall be provided for the grate.

2.3 CONCRETE MANUFACTURE REQUIREMENTS

- A. Mixture - The aggregates, cement and water shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete meeting the strength requirements of

PRECAST CONCRETE STRUCTURES 03416-5

this specification. The proportion of Portland cement in the mixture shall not be less than 564 pounds (6 sacks) per cubic yard of concrete.

- B. Curing - The precast concrete elements shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength in 28 days or less. Any one of the following methods of curing or combinations thereof shall be used:
 - 1. Steam Curing - The precast elements may be low-pressure steam cured by a system that will maintain a moist atmosphere.
 - 2. Water Curing - The precast elements may be water cured by any method that will keep the sections moist.
 - 3. Membrane Curing - A sealing membrane conforming to the requirements of ASTM Specification C 309 may be applied and shall be left intact until the required concrete compressive strength is attained. The concrete temperature at the time of application shall be within + 10 degrees F of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.
- C. Forms - The forms used in manufacture shall be sufficiently rigid and accurate to maintain the tank dimensions within the permissible variations given in Section 7 of these Specifications. All casting surfaces shall be of smooth nonporous material.
- D. Handling - Handling devices or holes shall be permitted in each precast element for the purpose of handling and installation.
- E. Storage - The precast elements shall be stored in such a manner to prevent cracking or damage.

PART 3 – EXECUTION

3.1 FABRICATION AND ASSEMBLY

- A. The manufacturer shall check and verify all dimensions, elevations, and locations of openings, anchor bolts, inserts, and other cast-in items. Any discrepancy or lack of information shall be reported to the Engineer before fabrication.
- B. The Contractor shall be responsible for any failure to precast sections to the correct dimensions and for any omissions or inaccuracies in the manufacture. If, in the opinion of the Engineer, proper corrections cannot be made, the section shall be rejected and shall be replaced with a new section at the Contractor's expense.
- C. The tank shall be monolithic, sealed and waterproofed by the manufacturer at the plant.

3.2 INSTALLATION

PRECAST CONCRETE STRUCTURES 03416-6

- A. Erection shall be done by experienced workmen, in accordance with previously mentioned standards.
- B. No field holes or cuts shall be made in any section without prior approval of the Engineer. All holes shall be cut in accordance with manufacturer recommendations.
- C. The Manufacturer shall be responsible for delivery of the entire system and shall provide representation to off load and set the unit in place. The unit shall be set per Contract Document, and final touch-up completed if necessary.

3.3 CONSTRUCTION REQUIREMENTS

- A. Placement of the Tank - The tank shall be placed as shown on the Engineer's Drawings. Special care shall be taken in setting the element to the true line and grade.
- B. Backfill
 - 1. Backfill shall be considered as all replaced excavation adjacent to the tank. The project construction and material specifications, which include the specifications for excavation for structures and roadway excavation and embankment construction, shall apply except as modified in this section. No backfill shall be placed against any structural elements until they have been approved by the Engineer.
 - 2. Mechanical tampers or approved compacting equipment shall be used to compact all backfill immediately adjacent to tank. The backfill within the Critical Backfill Zone as recommended by the precast manufacturer shall be placed in lifts of eight inches or less (loose depth).
 - 3. Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost to the project.
 - 4. As a precaution against introducing unbalanced stresses in the tank when placing backfill, at no time shall the difference between the heights of fill on opposite sides of the tank exceed 24 inches.
 - 5. See Earthwork Specification Section 02200 for additional backfill requirements.

3.4 QUALITY CONTROL/TESTING AND INSPECTION

- A. Testing Agency: The Contractor will engage a qualified independent testing and inspecting agency subject to Owner approval to sample materials, perform tests, and submit test reports during concrete placement. Tests shall be performed according to ACI 301.

PRECAST CONCRETE STRUCTURES 03416-7

- B. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- C. Type of Test Specimen - Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing, a minimum of 4 cylinders shall be taken during each production run. For core testing, one core shall be cut from each of 3 precast elements selected at random from each production group. A production group shall be defined as 15 or fewer precast structures (of a particular size), wingwalls or headwalls in a continuous production run. For each continuous production run, each production group or fraction thereof shall be considered separately for the purpose of testing and acceptance. A production run shall be considered continuous if not interrupted for more than 3 consecutive days.
- D. Compression Testing - Cylinders shall be made and tested as prescribed by the ASTM C 39 Specification. Cores shall be obtained and tested for compressive strength in accordance with the provisions of the ASTM C 497 Specification.
- E. Acceptability of Cylinder Tests - When the average compressive strength of all cylinders tested is equal to or greater than the design compressive strength, and not more than 10% of the cylinders tested have a compressive strength less than the design concrete strength, and no cylinder tested has a compressive strength less than 80% of the design compressive strength, then the lot shall be accepted. When the compressive strength of the cylinders tested does not conform to this acceptance criteria, the acceptability of the lot may be determined as described in section 8.4, below. Failure of any of the 28-day test cylinders to meet 90 percent of the minimum compressive strength requirement can be cause for rejection.
- F. Acceptability of Core Tests - The compressive strength of the concrete in each production group as defined in 8.1 is acceptable when the average core test strength is equal to or greater than the design concrete strength. When the compressive strength of the core tested is less than the design concrete strength, the precast element from which that core was taken may be re-cored. When the compressive strength of the re-core is equal to or greater than the design concrete strength, the compressive strength of the concrete in that production group is acceptable.
 - 1. When the compressive strength of any re-core is less than the design concrete strength, the precast element from which that core was taken shall be rejected. Two precast elements from the remainder of the group shall be selected at random and one core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the compressive strength of the remainder of that group is acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the group shall be rejected or, at the option of the manufacturer, each precast element of the remainder of the group shall be cored and accepted individually, and any of these elements that have cores with less than the design concrete strength shall be rejected.

PRECAST CONCRETE STRUCTURES
03416-8

2. Plugging Core Holes - The core holes shall be plugged and sealed by the manufacturer in a manner such that the element will meet all of the test requirements of this specification. Precast elements so sealed shall be considered satisfactory for use.

G. Test Equipment - Every manufacturer furnishing precast elements under this specification shall furnish all facilities and personnel necessary to carry out the tests required.

3.5 WORKMANSHIP AND FINISH

The tank shall be substantially free of fractures. The surface of the precast elements shall be a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth, steel-form finish.

3.6 REPAIRS

Precast elements may be repaired, if necessary, because of imperfections in manufacture or handling damage, and they will be acceptable if, in the opinion of the purchaser, the repairs are sound, properly finished and cured and the repaired section conforms to the requirements of this Specification.

3.7 INSPECTION

The quality of materials, the process of manufacture, and the finished precast elements shall be subject to inspection by the purchaser.

3.8 REJECTON

The precast elements shall be subject to rejection because of any of the specification requirements. Individual precast elements may be rejected because of any of the following:

- A. Fractures or cracks passing through the wall, except for a single end crack that does not exceed one half the thickness of the wall.
- B. Defects that indicate proportioning, mixing, and molding not in compliance with these Specifications.
- C. Honeycombed or open texture.
- D. Damaged edges, where such damage would prevent making a satisfactory joint.

END OF SECTION 03416

PRECAST CONCRETE STRUCTURES 03416-9

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SECTION 03500

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section covers materials, equipment and procedures to pressure inject water reactive chemical grout, for sealing concrete cracks.
- B. General: Submit in accordance with Condition of Contract and Division 1 – General Requirements Specification Section.

1.2 SUBMITTALS

- A. General: Submit in accordance with Condition of Contract and Division 1 – General Requirements Specification Section.
- B. Six sets of shop drawings of the materials specified herein shall be submitted to the Engineer for review.
- C. Submit six copies of manufacturer's literature for products furnished, including application instructions, appropriate Material Safety Data Sheets (MSDS), and other safety requirements.
- D. Qualifications
 - 1. Submit a letter attesting to the following:
 - a. Workers that will perform work for this section have a minimum of 5 years experience, successfully applying the materials specified in the section, or that workers have been properly trained, and will be supervised by someone who is properly trained and has the necessary experience.
 - b. Workers and supervisors have read and understand requirements described in the manufacturer's literature, and application instructions.
 - c. Workers will have proper and adequate equipment, including two separate pumps; one for pumping water, and one for pumping grout, so as to be able to complete the work according to provisions of this section, and the manufacturer's instructions.

1.3 DELIVERY, STORAGE AND HANDLING

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION 03500-1

- A. Deliver materials to job site in sealed undamaged containers with labels intact and legible, indicating material name, date of manufacture and lot number.
- B. Store materials indoors or outdoors and covered, at temperatures not *exceeding 85 degrees Fahrenheit (29 degrees Celsius)*.

1.5 QUALITY ASSURANCE

- A. Install materials in accordance with safety and weather conditions required by the manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction.
- B. Seal doors, windows, air intakes, elevators and other openings that could allow vapors to migrate into occupied spaces.
- C. Ventilate interior and exterior application areas, and all occupied spaces adjacent to application areas, during the application of grout.
- D. Remove open fires and spark producing equipment from the application area until vapors have dissipated.
- E. Curing Conditions for Water Reactive Grout:
 - 1. Cracks/Joints must be wet or the materials will not properly react and cure.
 - 2. Do not apply if the air temperatures are lower than 40 degrees Fahrenheit (4 degrees Celsius) *or if temperatures are expected to drop below 40 degrees Fahrenheit (4 degrees Celsius) within 24 hours of application; or higher than 120 degrees Fahrenheit (48 degrees Celsius)*.
 - 3. Cure times are affected by water temperature. Lower temperatures and/or lack of water can extend or prevent curing.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Where chemical grout for pressure injecting is required, provide AV-275 SOILGROUT manufactured by Avanti International, or approved equal.

2.2 MATERIALS

- A. Water reactive elastomeric chemical grouts meeting or exceeding the following typical physical and performance properties:

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION 03500-2

Table 1 - Typical Physical properties for Urethane Hydrophobic Grout

Property	Measuring Standards & Conditions	Results
Appearance	Visual	Light Amber Liquid
Solids Content by Weight	ASTM D 1010	100%
Viscosity	ASTM D 1638 @ 70° F	500 cps
Weight per Gallon	ASTM D 1638	
	+/- 0.1 lbs./gal.	9.15 lbs./gal.
	(+/- 0,01 kg/litre)	(1,1 kg/litre)
Flash Point		280° F
Corrosiveness		Non-corrosive

Table 2 - Typical Performance Properties

Property	Measuring Standards and Conditions	Results
Formulation Composition		1%-10% Accelerator in water side to decrease cure time(optional)
Density	ASTM D 3574-86	14 lbs./ft3 (226 kg/m3)
Tensile Strength	ASTM D 3574-86	30 psi (0,55 – 0,62 Mpa)
Elongation	ASTM D 3574-86	44-50 %
Shrinkage	ASTM D 756 Procedure D, ASTM D 1042	<1 % linear shrinkage
Toxicity		Non-toxic in cured form, contact manufacturer for more information

2.3 ACCESSORIES

- A. Additives and cleaners as recommended by manufacturer.
- B. Oil-free oakum or open cell urethane backer rod.

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION 03500-3

- C. Technical grade or higher acetone, or other suitable solvent as recommended by the manufacturer.

2.4 EQUIPMENT

- A. Two pumps are required, one for pumping water and one for pumping grout. Pumps must have a maximum pressure capacity of 2500 to 3000 psi (170 – 204 bars) and a minimum volume *capacity of 1/3 gpm (2,5 litre/minute) at full pressure.*
- B. Solvent and moisture resistant hose: minimum ¼ inch I.D. (6mm).
- C. Two application control valves with fluid filled gauges, and dampeners, 0-3000 psi (0-204 bars) that are compatible with pumps.
- D. Injectors (packers) with male zerk fittings, usually 5/8 inch (15 mm) diameter (with extra zerk fittings) supplied by Avanti International.
- E. Hammer drill, air powered or electric. Example: Hilti, Bosch, Black and Decker.
- F. Masonry drill bits various lengths and proper diameter to match injectors.
- G. Generator and/or compressor.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean mineral deposits (if present) from the crack face. This should help the applicator inspect the cracks, to understand crack location and size. Precise crack location is required to determine location of the holes for injectors. Crack size determination is required to decide injector spacing.
- B. Crack cleaning may be done by one or all the following methods: high pressure water, wire brush, light duty chipping hammer, grinding wheel.
- C. Remove any and all materials that are in the joint area. Clean out the joint completely if possible. Joint cleaning can be done by the same methods listed in “B”.

3.2 EXAMINATION

- A. Inspect the areas to be sealed with grout to assure that the surfaces are clean and wet. Materials will not properly cure if pumped into a dry crack/joint.
- B. Assure that the injectors are properly seated, to avoid leaking material, and a loss of pumping pressure.

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION 03500-4

- C. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping, roughen to a ¼ inch amplitude, and washing off all dirt, scum and laitance. It then shall be moistened prior to placing new concrete.

3.3 APPLICATION

A. DRILLING HOLES FOR INJECTORS:

1. Do not drill directly into a crack unless concrete is less than 6 inches (15 cm) thick, or if offset drilling is not possible.
2. Injection Test Holes: Drill one or two injection holes on the right or left side of the crack. These first injection holes are test holes to determine which side of the crack should be sealed first and how far materials will travel along the crack. Only the water pump should be charged and ready to pump for test holes. If something goes wrong during test hole pumping, it is very easy to clean a water pump.
3. Do not fill the material pump, or open pails of grout, until AFTER the test hole pumping.
4. For a vertical wall, always begin drilling at the lowest point of a crack and work up. Drill the first injection hole at the lowest point on the crack possible. Drill the second injection hole on the same side of the crack, approximately 12 inches (30cm) up the crack from the first injection hole. Remember that injection holes are drilled at a 45-degree angle to intersect the crack halfway into the concrete.
5. Drilling Injection Holes in Concrete less than 6 inch (15 cm) thick
 - a. Concrete 6 inches (15 cm) thick or less may require drilling the injection holes directly into the cracks to properly seal them.
 - b. Drill the injection holes deeper than 2 inches (5 cm), but not more than 5 inches (12 mm) deep, to expose a larger area of crack surface to the materials. This will allow deeper penetration and better pressure relief. More crack surface area exposed in the injection hole equals lower pump pressure required to seal the crack. Surface sealing the crack may be required.
6. Drilling Injection holes in Concrete 6 to 36 inches (15 cm – 91 cm) thick
 - a. Determine injection hole position. This is one of the most important phases of the sealing process. Correct injection hole position allows proper injector installation and adequate material pumping. Incorrect injection hole position may prevent grout flow into the crack.
 - b. The distance from the crack to the injection hole origin, equals one-half of the concrete thickness. For example, drill injection holes for 12 inch (30 cm) thick concrete 6 inches (15 cm) from the crack.

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION 03500-5

- c. Drill injection holes at 45 degree angle to intersect the crack halfway through the concrete. At a 45 degree, angle, the injection hole depth equals the hypotenuse of a right triangle.
 - d. Drill injection holes deep enough to assure intersection with the crack. Drill hole depth is unpredictable because crack direction is irregular. Drill an injection hole and test for crack intersection by pumping water into the hole. (Note: a 16 inch (41 cm) deep 45 degree angle injection hole can be drilled into 12 inch (30 cm) thick concrete without drilling through the concrete. If the injection holes are not properly drilled, the materials may not be evenly pumped into cracks, and may not completely seal the entire crack depth. Consequently, water may penetrate into sealed cracks behind the material. If fissures and honeycombs in the concrete exist behind the sealed cracks, small amounts of water may move around the sealed crack. Evidence of this will appear as damp or wet spots along the crack.
7. The spacing between the holes is critical, and is a function of crack width. The tighter the crack, the closer the holes. Typically, holes will be spaced 1½ times the distance that the test water travels. With very wide cracks that have a surface dam over them, the spacing may be quite large.

B. INSTALLING INJECTORS

1. Insert the injector in the hole.
2. Lightly tap on the socket (possibly reversed) or installation tool with a rubber mallet to ensure a snug fit, and insertion to the proper depth. Do not strike the zerk fitting with the hammer.
3. Tighten the injector using a deep socket and a ratchet. Tighten approximately *3 to 4 turns* or until snug.
4. To test, pump water into the injector, beginning with low pressure.
5. Increase pressure slowly and incrementally. Sudden surges of pressure can cause the injector to shoot out of the hole, in a very dangerous manner.
6. Check for leaking water as pressure is increased.
7. If water is leaking around the injector, stop pumping water and slowly tighten 1 to 2 turns more.
8. Resume pumping water, incrementally increasing pressure.
9. Continue to increase the pressure and watch for leaking water. Slowly tighten 1 to 2 turns each time leaks are observed, until the pressure required to pump the material is reached, but the injector is not leaking.

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION 03500-6

C. WATER INJECTION

1. Clean, potable water must be used to flush cracks. Water must be injected into a crack prior to the injection of grout.
2. When pumping water or grouts into an injector use care to increase the pressure very slowly. Sudden pressure increases can blow out the injector or crack the concrete. Use the proper injection control gun to avoid accidents.

D. GROUT INJECTION

1. Begin injecting grout immediately after the cracks have been flushed with fresh water. Do not flush cracks, then wait until the next day to begin grout injection. If grout injection has not begun 30 minutes after water injection, or if cracks appear dry, re-inject water into the cracks. Re-tightening injectors may also be required. The rubber gasket on the injector will relax over time. Use caution and water test the injectors, slowly building pressure. Further, if an accelerator is used in the injection water, the grout injection must begin immediately, because accelerator can evaporate from the water.
2. Begin injecting the grout slowly, building pressure on the injector. If recommended equipment is used, the applicator will have control of pressures. Pump grout at the lowest possible pressure with the application control valve fully open. Refer to the schedules for a pressure guide that may be associated with varying crack sizes. Sealing fine cracks at high pressures, with the application control valve in the full open position, may cause cracking, spalling or other damage, to weak concrete. Build pressure very slowly for fine cracks. Pump pressure should be 3000 *psi* (204 bars) maximum and the control valve should not be fully open. This should slowly allow efficient volumes to be pumped into the crack.
3. When grout injection begins, water is displaced from the crack and injection hole. Water may continue to run from the crack for several minutes before grout appears. The first sign of grout is a very light foamy substance, which thickens over time to look like shaving cream. Continue injecting grout until pure resin flows from the crack and until grout has traveled the desired distance between the injectors. Varying grout pump pressure will help the grout travel as far as possible. If grout does not travel the required distance between injectors, it may be necessary to drill an injection hole between existing injectors.
4. Re-inject a small amount of water into the injection hole after injecting grout. This assures that the remaining material in the hole will be reacted.

END OF SECTION 03500

WATER REACTIVE ELASTOMERIC CHEMICAL GROUT INJECTION
03500-7

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SECTION 03700

MODIFICATIONS TO EXISTING CONCRETE

PART 1- GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to cut, remove, repair and modify parts of the existing concrete wet well top surface cover as indicated and as specified herein.
- B. The repair work specified herein is intended to cover the requirements for repair of the distressed concrete within the wet well top cover that contains the access hatch and as noted on the contract documents.

1.02 RELATED WORK

- A. None

1.03 REFERENCES

- A. The following standards form a part of these specifications:
 - American Society for Testing and Materials (ASTM)
 - ASTM C33 Standard Specifications for Concrete Aggregates
 - ASTM C150 Standard Specification for Portland cement
 - ASTM C321 Standard Test for Bond Strength of Chemical-Resistant Mortars
 - ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- B. Where reference is made to the above standard, the revision in effect at the time of bid opening shall apply.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01300 SUBMIT THE FOLLOWING:

- A. Seven sets of shop drawings of the materials specified herein shall be submitted to the ENGINEER for review.

MODIFICATIONS TO EXISTING CONCRETE 03700-1

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original, unopened containers clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

1.06 QUALITY ASSURANCE

- A. When removing distressed concrete found within the existing wet well cover structures, erect barriers, shoring and bracing and other protective devices to prevent damage or to drop material into the wet well for any repair or demolition work to the cover that may involve the inner wet well to control dust and demolition debris from getting into the wet well.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials shall comply with this Section and any Federal, State or local VOC limitations.
- B. The cementitious repair mortar system shall be non-shrink cementitious type and meet the following requirements:
 - 1. It shall be commercially manufactured product that does not shrink in either the plastic or hardened state and is dimensionally stable in the hardened state.
 - 2. The repair mortar shall be Portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and shall require only the addition of water. It shall not contain expansive cement or metallic particles.
 - 3. Cementitious repair mortar shall be:
 - a) SikaRepair 222 by Sika Corp.
 - b) Sikacrete 211 SCC Plus by Sika Corp
 - c) Five Star Grout by Five Star Products, Inc.
 - d) MasterEmaco N425 by BASF Building Systems, Inc.
 - e) MasterFlow 110AN by BASF Building Systems, Inc.
 - f) NS Grout by Euclid Chemical Co.
 - g) Sika MonoTop 615 by Sika Corp
 - g) Or equal.
 - 4. Compressive Strength:
Method: ASTM C-109 for 7 days curing
Requirements: Minimum 4,000 psi

MODIFICATIONS TO EXISTING CONCRETE 03700-2

5. Color: Concrete grey.
- C. Epoxy Modified Bonding Agent. Provide a two-component or three-component, solvent-free, asbestos-free moisture insensitive epoxy modified resin material used to bond plastic concrete to hardened concrete where indicated and complying with the requirements of ASTM C881, Type II, Grade 2. Bonding agent shall be:
1. Sika Armatec-110 EpoCem by Sika Corporation, Lyndhurst, NJ
 2. MAPEI Mapefer 1K, by MAPEI
 3. MAPEI Planibond 3C by MAPEI
 4. DURALPREP A.C. by Euclid Chemical Co., Cleveland, OH
 5. Or equal.
- D. Adhesive Anchors
1. Adhesive Anchors shall be selected from:
 - a) Hilti HIT-RE 500-SD by Hilti, Inc.
 - b) Simpson Strong-Tie SET-XP by Simpson Strong-Tie Co., Inc.
 - c) Sikadur 32, Hi-Mod LPL by Sika Corporation, Lyndhurst, NJ
 - d) Or Equal
- E. Undercut Anchors.
1. Undercut anchors shall be selected from:
 - a) HDA or HDA-12 by Hilti, Inc.
 - b) DUC Undercut Anchors by USP Structural Connectors
 - c) Torq-Cut Anchors by Simpson Strong-Tie Company, Inc.
 - d) Or equal
 2. Undercut anchors shall be used for all anchor connections where adhesive anchors are in tension 100% of the time.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Cut, repair, remove, and modify parts of the existing structures as indicated and specified. Finishes, joints, reinforcements and sealants are specified in their respective sections. All work shall comply with the requirements of this Section and as indicated.

MODIFICATIONS TO EXISTING CONCRETE 03700-3

- B. When drilling holes for dowels/bolts, stop drilling if reinforcing is encountered. As approved by the ENGINEER relocate the hole to avoid reinforcing. Do not cut reinforcing without prior approval by the ENGINEER. Where possible, identify reinforcing locations prior to drilling using "rebar locators" so that drill hole locations may be adjusted to avoid reinforcing interference.

3.02 CONCRETE REMOVAL

- A. When removing concrete, line drill at limits of removal. Remove concrete such that existing concrete and reinforcing to be left in place and existing equipment in place are not damaged. Saw cut at limits of concrete to be removed only where indicated or specified.
- B. Where the joint between new concrete or grout and existing concrete will be exposed in the finished work, the edge of concrete removal shall be a 1-in deep sawcut on each exposed surface of the existing concrete except as otherwise indicated or specified.
- C. Repair or replace concrete specified or shown to be left in place which is damaged during concrete modifications at no additional cost to the Project.

3.03 CONNECTION SURFACE PREPARATION

- A. Prepare connection surfaces as specified below for concrete areas requiring patching, repairs or modifications as indicated, or specified.
- B. Remove all loose and deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means such as sandblasting, chipping or wire brushing. Uniformly roughen the concrete surface to approximately ¼ -in amplitude. Thoroughly clean surface of loose or weakened material and dust by dry mechanical means such as sandblasting and airblasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete.
- C. If reinforcing steel is exposed, clean it by dry mechanical means to remove all loose material, contaminants and rust as approved by the ENGINEER. If half of the diameter of the reinforcing steel or more is exposed, chip out a minimum of 1-in of concrete behind the steel. Do not damage reinforcing to be incorporated in new concrete while removing existing concrete.
- D. Clean exposed reinforcing that is to be incorporated in new concrete. Use dry mechanical means to remove all loose material, contaminants, and rust before proceeding. Cut, bend or lap existing reinforcing to new reinforcing as indicated with allowance for 2-in minimum cover all around.

MODIFICATIONS TO EXISTING CONCRETE 03700-4

- E. Prepare concrete surfaces in accordance with the following as indicated or specified.
1. After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate with water and maintain saturation for a period of at least 12 hours.
 2. Brush on an epoxy modified bonding agent with anti-corrosion coating on all surfaces. The field preparation and application of the epoxy modified bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture as indicated within time constraints recommended by the manufacturer to ensure bond.
 3. Where adhesive anchors are used, core a hole 1/8-inch larger than the diameter of the dowel or bolt. The hole shall be blown clear of loose particles and dust just prior to installing adhesive. The cored hole shall first be filled with adhesive. The dowel/bolt shall be buttered with adhesive and inserted with a twisting motion.
 4. Where rebar splicing is required to a short stub bar cut or damaged, the new deformed bars shall be drilled within 6" of the bar to be spliced to and to a depth of at least 8". Anchor the rebar per adhesive manufacturer's recommendations. Remove excess adhesive before it hardens.
 5. Where ordinary anchor bars and rebar is required to anchor within a mass of concrete, drill a hole at least ten bar diameters for all-thread bars and for smooth bars drill and set to a depth of 15 bar diameters. Anchor the rebar per adhesive manufacturer's recommendations. Remove excess adhesive before it hardens.
- F. Where undercut anchors are used, preparation and installation of the anchors shall strictly follow manufacturer's printed recommendation.

END OF SECTION

MODIFICATIONS TO EXISTING CONCRETE
03700-5

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DIVISION 9 – PAINTING

<u>Section</u>	<u>Title</u>	<u>Page</u>
09900	Painting and Coating	09900-1
09900	Shop Primers	09901-1

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SECTION 09900
PAINTING & COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Work of this Section consists of the provision of all labor, materials, services, equipment and incidental items required to complete the masonry work shown on the Drawings and specified herein, including but not limited to:
1. Field painting of exposed interior items and surfaces.
 2. Surface preparation for painting.

1.2 DEFINITIONS AND EXTENT

- A. General: Standard coating items defined in ASTM D 16 apply.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to a low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 3. Semigloss refers to a medium-sheen finish with a gloss range below 35 and 70 when measured at a 60-degree meter.
 4. Full gloss refers to a high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- B. This Section includes surface preparation and field painting of exposed interior and exterior items and surfaces.
1. Surface preparation, priming and finish coats specified in this Section are in addition to shop priming and surface preparation specified in other Sections.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or it to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Engineer will select from standard colors and finishes available.
- D. Painting includes field painting of exposed bare and covered pipes (including color

PAINTING & COATING
09900-1

coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not a factory-applied final finish.

- E. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts and labels.

1.3 REFERENCES:

- A. The following standards form a part of this specification as referenced:

The National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (Current Edition).

ASTM C94	Ready-Mix Concrete
ASTM C109	Comprehensive Strength
ASTM C267	Chemical Resistance
ASTM C596	Shrinkage
ASTM C666, Method A	Freeze/Thaw Resistance
ASTM D4414	Standard Practice for Measurement of Wet Film Thickness for Organic Coatings
ASTM 543	Resistance of Plastics to Chemical Reagents
ASTM 638	Tensile Properties of Plastic
ASTM 695	Comprehensive Properties of Rigid Plastics
ASTM D790	Flexural Properties of Unreinforced and Reinforced Plastics

1.4 SUBMITTALS

- A. Product Data: For each paint system indicates, including block filler and primers.
 - 1. Material List: Inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing and applying each coating material.
 - 3. Material Safety Data Sheets
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color and texture are achieved.

2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit two 8 in. x 12 in. Samples for each type of finish coating for Engineer's review of color and texture only.

C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in apply paints and coating materials similar in material, design and extent to those indicated, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block filler and primes for each coating system from same manufacturer as finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information.
 1. Product name or title of material.
 2. Product description (generic classification or type.)
 3. Manufacturer's stock number and date of manufacturer.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg. F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 1. Protect from freezing.
 2. Keep storage area neat and orderly.
 3. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

PAINTING & COATING 09900-3

- A. Apply waterborne paints only when temperature of surfaces to be painted and surrounding air are between 50 and 90 deg. F.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air are between 45 and 95 deg. F.
- C. Do not apply in snow, rain, fog or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg. F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRAMATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: Furnish four (4) unopened gallons of each type of paint and coating work, in color and gloss as used for the Project.

1.9 WARRANTY:

- A. The work performed shall be warrantied against infiltration and faulty workmanship and materials for a period of one (1) year after the project is accepted by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, acceptable products are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, finish coat materials and other painting and coating materials that are compatible with one another and with the substrates indicated, under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory-formulated and recommended by manufacturer for application indicated. Paint material containers not displaying manufacturer's product identification will not be acceptable.

PAINTING & COATING 09900-4

2.3 PATCHING MIX:

A quick-setting cementitious material shall be used as a patching mix to fill voids greater than ¼” deep, and is to be mixed and applied according to the manufacturer’s recommendation and shall have the following minimum requirements.

Compressive Strength	ASTM C-109	6 hr 1,400 psi
Shrinkage	ASTM C-596	0% AT 90% Relative Humidity

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for paint application.
 - 1. Proceed with paint application only after unsatisfactory condition have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total painting and coating system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Engineer about anticipated problems when using the painting or coating materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning:
 - 1. Before applying paint or other surface treatments, clean substrates of substances that could impair bond the various coatings. remove oil and grease before cleaning.

PAINTING & COATING 09900-5

2. Schedule cleaning and painting so dust and other contaminants from cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete unit masonry (CMU), cement plaster and cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils and release agents. roughen as required to remove glaze.
 3. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation:
 - a. Use abrasive blast-cleaning if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surface by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the follow with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop-coated; remove oil, grease, dirt, loos mill scale and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean, as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 5. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's

PAINTING & COATING
09900-6

written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and technique best suited for substrate and type of material being applied.
 1. Paint surface treatments and finishes are indicated in the Paint Schedule and Painting & Coating Schedule.
 2. Where applicable, paint colors are to comply with regulator requirements; all other paint colors are to be selected by the Engineer.
 3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions detrimental to formation of a durable paint film.
 4. Exposed surfaces includes areas visible when permanent fixtures, equipment and similar components are in place. Extend painting and coating in these areas, as required to maintain painting system integrity and provide desired protection.
 5. Before final installation of equipment, paint surfaces behind permanently fixed equipment with prime coat only.
 6. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until pervious coat has cured, as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color and appearance. Give special attention to ensure that edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Applications Procedures: Apply paints and coatings by brush, roller, spray or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back or hi-pile sheep's wool, as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
 2. Pipe hangers and supports.
 3. Mechanical equipment indicated to have a factory-primed finish for field painting.
- F. Electrical items to be painted include, but are not limited to, electrical equipment indicated to have factory-prime finish for field painting.
- G. Block Fillers: Apply block fillers to concrete masonry block (CMU) at a rated to ensure complete coverage with pores filled.

PAINTING & COATING
09900-8

- H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed area in first coat appears to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth opaque surface of uniform finish, color, appearance and coverage. Surface imperfections, including cloudiness, spotting, holidays, brush marks, runs, ropiness, laps or other surface imperfections will not be acceptable.
- J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes or other surface imperfections.
- K. Complete Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. Engineer may have a qualified Testing Agency sample painting materials, when the materials are being used on site. Samples will be taken, identified, sealed and certified in the presence of the Painting Contractor.
- B. Testing Agency will perform appropriate tests on the samples and provide test results to the Engineer and Painting Contractor.
- C. If test results show material being used does not comply with specified requirements, Painting Contractor shall remove noncomplying paint materials from the site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Painting Contractor may be required to remove noncomplying paint materials from previously painted surfaces if, on repainting with specified paint, the coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish and other discarded paint materials from the site.
- B. After completing painting, clean of paint spatter, removing spattered paint by washing and scraping without scratching or damaging the spattered surface or adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correction damage cleaning, repairing or replacing, and repainting as

approved by Engineer.

- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
- C. After work of other trades is complete, touchup and restore damaged or defaced painted surfaces. Comply with procedures specified in DPCA P1.

3.7 PAINT SCHEDULE

- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.
- B. Concrete and CMU Floors and Walls:
 - 1. Surface Preparation: Shot-blast or mechanically abrade the concrete/CMU to remove all coatings, laitance, curing compounds, hardeners, sealers, and other contaminants and to provide surface profile; Reference: ICRI CSP3-5. Verify dryness by testing for Moisture Vapor Transmission Rate via an Anhydrous Calcium Chloride Test; Reference: ASTM F 1869. Test pH levels via litmus paper testing to assure pH levels have been neutralized. Concrete and CMU shall have been cured for 28 days minimum before application of materials.
 - 2. Coating Schedule:
 - a. Primer / Sealer: Apply one full coat of Loxon concrete and masonry primer and sealer at 2.1 – 3.2 mils DFT.
 - b. Final Coat: Apply two full coats of Pro Industrial DTM Acrylic at 2.5 - 4.0 mils DFT per each coat.

3.8 FIELD TESTING/INSPECTION:

- A. Material Testing: One 2 x 2 inch sample cube shall be taken for every 50 bags of cementitious lining material used. Samples shall be sprayed from the nozzle of the application equipment, identified and sent to an independent test laboratory for compression strength testing as described in ASTM C109.
- B. Thickness Testing: During application of the corrosion protective coating a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.
- C. Holiday Testing: After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment. Surfaces shall first be

dried, an induced holiday shall then be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday (refer to NACE RPO188-99). All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations.

- D. Bond Strength: Measurement of bond strength of the protective coating to the substrate shall be made at regular intervals and along different sections of the structure. Bond strength shall be measured in accordance with ASTM D4541. Any areas detected to have inadequate bond strength shall be evaluated by the Project Engineer. Further bond tests may be performed in that area to determine the extent of potentially deficient bonded area and repairs shall be made by Applicator in strict accordance with manufacturer's recommendations.
- E. All inspecting, testing, and reworking within the warranty period shall be provided at no additional cost to the Owner.

END OF SECTION 09900

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SECTION 09901

SHOP PRIMERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions, Division 0 and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY OF WORK

- A. The work covered under this Section of the specifications includes furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with applying shop primers on ferrous metals, excluding stainless steel, complete in place in accordance with the Drawings and Specifications.
- B. Related Sections include the following:
 - 1. Field painting is included under Section 09900.
 - 2. Division 1 - General Requirements
 - 3. Division 11 – Equipment
 - 4. Division 16 – Electrical

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – Submittal Procedures.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.

PART 2 - PRODUCTS

2.1 SURFACE PREPARATION

- A. Shop Blast Cleaning: Reference Paragraph “Shop Coating Requirements”.
- B. Surface Preparation: Provide Engineer minimum 7 days’ advance notice to start of shop surface preparation work and coating application work.

2.2 SHOP COATING REQUIREMENTS

SHOP PRIMERS 09901-1

- A. When required by equipment Specifications, such equipment shall be primed and finish coated in shop by manufacturer and touched up in field with identical material after installation.
- B. Where manufacturer's standard coating is not suitable for intended service condition, Engineer may approve use of a tie-coat to be used between manufacturer's standard coating and specified field finish. In such cases, tie-coat shall be surface tolerant epoxy as recommended by manufacturer of specified field finish coat. Coordinate details of equipment manufacturer's standard coating with field coating manufacturer.

2.3 NON-PRIMED SURFACES

- A. Gears, bearing surfaces and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease. Grease coating shall be maintained as necessary to prevent corrosion during storage and erection up to the time of application of a field coating of grease.

2.4 COMPATIBILITY WITH FIELD PAINTS

- A. The primers and paints used in the field shall be products of the same manufacturer and recommended for use together, and shall meet the requirements of Section 09900 – Painting and Coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Factory Finished Items:

1. Provide Engineer minimum 7 days' advance notice to schedule inspection of factory-finished items delivered to Site to review factory priming and factory finish.
2. Repair abraded or otherwise damaged areas on factory-finished items as recommended by coating manufacturer. Carefully blend repaired areas into original finish. If required to match colors, provide full finish coat in field. Repair shall be the responsibility of the General Contractor.
3. Full repair to damaged areas of factory-finished items, as determined by the Engineer, is to be done at no cost to the Owner. Full repair shall be responsibility of the General Contractor.

- B. Surface Preparation Verification: Inspect and provide substrate surfaces prepared in accordance with these Specifications and printed directions and recommendations of paint manufacturer whose product is to be applied. The more stringent requirements shall apply.

3.2 PROTECTION OF ITEMS NOT TO BE PAINTED

SHOP PRIMERS
09901-2

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not specified elsewhere to be painted.
- B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
- C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.
- D. Mask openings in motors to prevent paint and other materials from entering.
- E. Protect surfaces adjacent to or downwind of Work area from overspray.

3.3 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – Contract Closeout.

END OF SECTION 09901

SHOP PRIMERS
09901-3

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DIVISION 11 - EQUIPMENT

<u>Section</u>	<u>Title</u>	<u>Page</u>
11200	Interior Process Piping and Valves	11200-1
11305	Flooded Suction Pumps	11305-1
11310	Access Hatch Grating	11310-1
11501	Process Gauges	11501-1

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SECTION 11200

INTERIOR PROCESS PIPING AND VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions, Division 0 and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY OF WORK

- A. The work covered under this Section of the Specifications includes the furnishing of all labor, equipment, appliances, and materials, and in performing all operations in connection with the furnishing, installation, and testing of interior process piping systems, including piping, pipe fittings and specials, mechanical couplings, victaulic couplings, wall seals and fittings, valves, flexible pipe connectors, strainers, jointing materials, pipe hangers and supports, and accessories of the various materials, sizes, classes, joints, and types, and appurtenant work, at the locations and to the general arrangements and details as indicated and/or as directed, complete in place, in accordance with the Contract Drawings and Specifications.
- B. Related sections include the following:
 - 1. Division 0 – Bidding and Contract Requirements
 - 2. Division 1 – General Requirements
 - 3. Division 11 – Equipment

1.3 SUBMITTALS

- A. Submittals shall be in accordance with the Conditions of the Contract and Division 1 Specifications Sections.
- B. Shop Drawings: Include materials lists, catalog cuts, and complete specifications for all piping materials including gaskets and connections. Shop drawings for all valves, valve operators, strainers, hangers and supports, wall seals and sleeves, flexible connections, cleanouts, and other like manufactured items. Detailed piping layout drawings of all interior and exterior piping and valves including location, type, and number of proposed pipe supports. Drawings of exterior piping shall also show the relationship between the work included in this Section and that included in others where in close proximity.

INTERIOR PROCESS PIPING & VALVES

11200-1

- C. Operation and Maintenance Manuals: Submit materials for inclusion in Operating and Maintenance Manuals specified in Division 1.

- D. Welding Qualifications:
 - 1. Weld Inspection and Testing Agency: Certification and qualifications.
 - 2. Welding Inspector: Certification and qualifications.
 - 3. Welders:
 - a. List of qualified welders and welding operators.
 - b. Current test records for qualified welder(s) and weld type(s) for factory and field welding.
 - 4. Weld Procedures: Records in accordance with ASME Boiler and Pressure Vessel Code, Section IX for weld type(s) and base metal(s).
 - 5. Nondestructive inspection and testing procedures.
 - 6. Test logs.
 - 7. Certified welding inspection and test results.

- F. Quality Assurance Qualifications
 - 1. Independent Inspection and Testing Agency:
 - a. Ten years' experience in field of welding and welded pipe and fittings' testing required for this Project.
 - b. Calibrated instruments and equipment, and documented standard procedures for performing specified testing.
 - c. Certified in accordance with ASNT SNT TC 1A for testing procedures required for this Project.
 - d. Testing Personnel: Qualified for nondestructive test methods to be performed.
 - e. Inspection Services: Qualified welding inspector.
 - 2. Welding Inspector: AWS certified, AWS QC 1 qualified, with prior inspection experience of welds specified.
 - 3. Welder and Welding Operator Qualifications:
 - a. Qualified by accepted inspection and testing agency before starting work in accordance with Section IX, Article III of the ASME Boiler and Pressure Vessel Code.

INTERIOR PROCESS PIPING & VALVES
11200-2

- b. Qualified to perform groove welds in Positions 2G and 5G for each welding process and pipe material specified.
 - c. Qualification tests may be waived by Engineer based on evidence of prior qualification.
- G. Quality Control: Provide services of independent inspection and testing agency for welding operations.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – Quality Assurance and as specified.
- B. The materials and equipment covered in this specification are intended to be standard materials and equipment of proven ability as manufactured by reputable concerns. Equipment shall be designed and constructed in accordance with the best practice of the industry and shall be installed in accordance with the manufacturer's recommendations and these Specifications. The Specifications call attention to certain features but do not purport to cover all details entering into the construction of the equipment.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Setting miscellaneous material. All anchors, bolts, inserts, supports, pipe wall fittings, pipe sleeves and such other materials occurring in connection with concrete and masonry work shall be furnished and placed accurately and maintained securely in position to lines and grades at the time of concrete and masonry placement. All necessary templates shall be provided.
- B. Drawings are diagrammatic and do not attempt to show each and every offset or all fittings. All changes and adjustments to the drawing layouts as required for conformity of the work to the structures as constructed, to equipment, to approved shop drawings, or to fit work of other trades shall be as approved by the Owner, and shall be included as part of the work under this Section of the Specifications at no additional expense to the Owner.

1.6 PIPE SCHEDULE

- A. Pipes, fittings and specials, appurtenances, and jointing shall be in accordance with the following schedule. This schedule is set forth as a guide as to types of materials and jointing required. The lack of mention of any specific pipe shall not relieve the Contractor from the responsibility of furnishing and installing all piping as required for the principal piping systems included under this Section of the Specifications and is presented herein for convenience of references for the Contractor.

INTERIOR PROCESS PIPING & VALVES 11200-3

PIPING SYSTEM	PIPE MATERIAL AND JOINTING
Pump Suction and Discharge	Flanged D.I. pipe, D.I. fittings and specials; pipe, fittings, and specials to be cement mortar lined, thickness class as specified herein.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following describes equipment, materials and services necessary to provide a complete, functional interior process piping and valves system. The interior process piping and valves system shall be a complete package that contains:
 - Pipes
 - Wall Seals and Sleeves
 - Expansion Joints
 - Valves
 - Valve Tags
 - Pipe Support Systems

- B. The interior process piping and valves system components shall arrive assembled with piping and valves system shop-assembled/installed to the fullest extent possible given the site, building, and access constraints. All other appurtenances mentioned herewith shall also be included for a complete and operational system.

2.2 PIPES

- A. Ductile Iron (DI) Pipe and Pipe Fittings. Ductile iron pipe shall be classified by Underwriters Laboratories Inc., in accordance with ANSI/AWWA A21.15/C115.
 1. Ductile iron pipe shall conform to the physical and chemical requirements of ANSI/AWWA A21.51/C151, and shall have dimensions and wall thicknesses and flanges in accordance with ANSI/AWWA A21.15/C115, Pressure Class 250 psi.
 2. Cement-mortar linings: ductile iron pipe, cast iron and ductile iron pipe fittings and specials, where indicated, shall be double thick cement-mortar-lined in accordance with ANSI Specification A 21.4. Thickness of the mortar lining shall be 1/8-inch for pipe 12-inches and smaller and 3/16-inch for pipe larger than 12-inches.
 3. Exterior Coating: The exterior surfaces of all other pipe and fittings shall be thoroughly cleaned and given one shop coat of manufacturer's recommended primer. The coating used shall be compatible with the coats to be field

INTERIOR PROCESS PIPING & VALVES
11200-4

applied. The shop coat shall be applied in accordance with the paint manufacturer's recommendations.

4. Ductile iron pipe, cast iron or ductile iron pipe couplings, fittings and specials shall have cast upon them the class, thickness designation and initials of the manufacturer.
4. Ductile Iron push-on and mechanical joints shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings".
5. All flanged joints for ductile iron pipe shall be made with bolts or bolt studs with a nut on each end and SBR rubber gaskets extending at least to the inside of the bolts. SBR rubber gaskets shall conform to AWWA C111 latest revision. Bolts and nuts shall be carbon steel, except if noted otherwise on the Drawings. Bolt studs and nuts shall be of the same quality as machine bolts. After fastening nuts to bolts or threaded rods, the threads of the bolt/rod shall extend a minimum of ½ inch outward from the face of the nut. A sample of the gaskets shall be submitted to the Engineer for approval.

2.3 WALL SEALS

- A. For pipe penetrations through existing reinforced concrete floors, and wall brick or concrete and masonry unit walls, Contractor shall core hole through concrete of sufficient diameter for pipe and annular space to accommodate seal. Cast-iron wall sleeves shall not be used for penetrations through existing concrete or brick walls or floors.
- B. The annular space created by the wall sleeve and the pipe or the existing concrete and the piping shall be positively sealed with "Link Seal", manufactured by Thunderline Corporation, or an approved equal. Seals shall be the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall, thus reducing chances of cathodic reaction between these two members.
- C. The Contractor shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabricating or installing the seals. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a water-tight joint.
- D. The Contractor shall be familiar with the installation of the seals according to the manufacturers' instruction bulletin which illustrates the proper procedure for installing and tightening the seal to provide a water-tight pipe penetration.

2.4 EXPANSION JOINTS

INTERIOR PROCESS PIPING & VALVES 11200-5

- A. Provide, where indicated on the drawings, specified or detailed, expansion joints of the single arch, rubber type for equipment and piping.
- B. Flexibility capacity (minimum), in inches or degrees,

Nom. Dia (in)	Axial Comp.	Axial Ext.	Lateral Deflection	Torsional Deflection	Angular Deflection
1-3	7/16	1/4	1/2	3	13
4-6	7/16	1/4	1/2	3	8
8-18	11/16	3/8	1/2	2	3

- C. Provide joints of pressure ratings as follows:
 - 1. Process Lines - minimum 250 psi rating
- D. The temperature rating of the expansion joints shall be minimum 225 deg. F for process lines.
- E. Expansion joints installed on solids laden lines shall be provided with filled arches. Movement capabilities of the filled arch joints shall be at least 50 percent of those hereinbefore specified for the unfilled arch joint.
- F. Expansion joints installed in piping systems must be anchored on both sides of the joint.
- G. Construction for service other than chlorine solution
 - 1. Joint consists of arched body with steel retaining rings. Body wraps around retaining ring to act as flange face.
 - 2. Body – Water and Chemical Service
 - a. Inner tube: Neoprene
 - b. Reinforcement: Bonded polyester/neoprene plies, unexposed to atmosphere.
 - c. Outer cover: Hypalon coated neoprene
 - 3. Retaining rings: 304 stainless steel or hot-dipped galvanized steel, unless otherwise approved.
 - 4. The temperature rating of the joint shall be as noted above.
 - 5. Manufacturers
 - a. Mercer Rubber Co., Toledo, OH

INTERIOR PROCESS PIPING & VALVES
11200-6

- b. General Rubber Corp., S. Hackensack, NJ
- c. Or Engineer Approved Equal.

2.5 VALVES

A. General:

1. The valves shall be suitable for wastewater applications.
2. Full-port design unless noted otherwise.
3. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
4. Valves in Insulated Piping: With minimum 2-inch stem extensions or greater as required to clear the insulation and jacketing.
5. Valve Sizes: Same as upstream piping unless otherwise indicated.
6. Valve-End Connections:
 - a. Solder Joint: With sockets according to ASME B16.18.
 - b. Threaded: With threads according to ASME B1.20.1.
 - c. Hose-End: Male hose-end, 3/4" with chained cap and gasket for drain valves.
7. EPA Compliance: EPA Safe Water Drinking Act for potable water service.
8. NSF Compliance: NSF 61 for valve materials for potable-water service.

B. Plug Valves:

1. The plug valves shall be non-lubricated, resilient seated, quarter-turn type.
2. Plug valves 4-inch to 24-inch shall have a minimum nominal port area of 100% of the pipe. The valve bodies shall be 316 stainless steel (ASTM A743, Grade CF-8M) providing a full circle seat area. Disc shall be the same material as body with upper and lower shafts integral. Resilient plug facing shall be BUNA-N. Valve ends shall be flanged complying with ANSI B16.1, Class 125. The valves shall provide bidirectional seating at 175 psi differential. Valve seating shall provide consistent opening/closing torque that is not dependent on field-adjusted stops. Resilient seating seal shall be field replaceable on the existing valve.
3. All surfaces shall be protected, both internally and externally, with a factory-coated heat-fused thermoset epoxy or thermoplastic nylon. These corrosion resistant coatings shall provide protection from corrosion in the shaft areas.

INTERIOR PROCESS PIPING & VALVES

11200-7

Bearing areas shall be isolated from solid particulars. The seat surface shall provide both corrosion and abrasion protection. All valves shall be of the bolted bonnet, top entry design, capable of being repacked without removing the bonnet or valve from the pipe line. All bolts and fasteners shall be 316 Stainless Steel.

4. Lever actuators shall be totally enclosed and sealed to prevent intrusion of water or dirt and have corrosion resistant bearings.

C. Check Valves

1. Check valves shall be rubber seated dampened swing check with outside counter weight and lever and shall meet the requirements of AWWA C508. The valve shall permit flow in one direction only and close tightly without slamming. The valve shall be cast iron (ASTM A126-13) with cast iron disc of similar material. The hinge shaft shall be stainless steel with disc arm and counterweight arm keyed thereon. The body seat shall be all bronze or stainless steel.
2. The valves shall be compatible with 125 pound ANSI drilled flange. Valves shall be cleaned and shop primed on the outside with a rust inhibitive priming system. The exterior and interior of the valve shall be coated with an NSF/ANSI 61 approved fusion bonded epoxy coating.
3. The top access port shall allow for the removal of the disc without removing the valve from the line. The access cover shall be domed in shape to provide flushing action over the disc.
4. The disc shall be of one-piece construction.
5. Manufacturers:
 - a. Val-Matic, Co
 - b. Dezurik, Inc.
 - c. Henry Pratt Company
 - d. Or Engineer Approved Equal

2.7 VALVE TAGS

- A. All valves in piping except individual valves provided with equipment shall be tagged with an aluminum or brass disc, wired to the valve, die-stamped with identifying numbers or letters.
- B. A flow diagram, identifying number and duty of each tagged valve, framed under safety glass, shall be furnished and mounted by the Contractor in the control room, at major equipment, or as directed by the Engineer.

INTERIOR PROCESS PIPING & VALVES 11200-8

2.8 PIPE SUPPORT SYSTEMS

- A. All supports and parts required for the installation of the piping systems shall conform to the requirements of Chapter 1, Section 6 of the ANSI Code for Pressure Piping (B-31.1), except as modified and supplemented by the requirements set forth herein. All piping shall be supported in such a manner to fulfill this specification. Pipe supports and restraints shall be adequate for the maximum test pressure specified herein or 1.5 times the apparent working pressure, whichever is greater. General contractor shall provide all pipe supports for piping, valves, equipment, and ancillary items described within Division 11.
1. Supporting appurtenances shall be arranged to prevent undue stress on equipment to which piping is connected. Supporting system shall be arranged without causing damaging deflection to the support member. Supporting appurtenances shall provide the desired pitch, as specified or required, for proper drainage of the piping. The pipe suspension shall prevent excessive stress, excessive variation in supporting force, and possible resonance with imposed vibration while the system is in operation. Supporting appurtenances, when used with copper piping, shall be copper, bronze or PVC dipped galvanized steel.
 2. All piping shall be supported independent of the equipment to which it is connected. All equipment shall be removable without needing temporary supports for adjacent piping. Any anchors for all supporting appurtenances shall be drilled expansion bolt type, power driven stud anchors are not acceptable. Expansion bolts shall be stainless steel, similar and/or equal to Kwik-Bolt.
 3. All metallic supporting appurtenances, except those used for copper piping, and as otherwise noted, shall be galvanized conforming to ASTM A-153 for threaded items, and ASTM A-123 for all other items. Supporting appurtenances in the classified and high humidity areas shall be stainless steel. Normal humidity service shall be defined as all spaces where there are no water-containing open tanks or channels. High humidity service shall be defined as any spaces near open water-containing tanks or channels. Hangers shall not become disengaged by movements of the supported pipe. Lock nuts shall be used on all hangers. All piping systems shall be supported by hangers that can vertically adjust for the leveling of lines after piping is in place. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing. All hanger rods, except those that are stainless steel, shall conform to ASTM A-575. Hanger rod diameters shall be as recommended by pipe hanger manufacturers for the type of pipe, hanger size, and spacing used.
 4. Piping shall be supported according to the Spacing Schedule below, and/or the MSS Standard Practice SP-69, (Manufacturers Standardization Society of

INTERIOR PROCESS PIPING & VALVES
11200-9

the Valve and Fitting Industry), whichever spacing is closer. A support shall also be located within four inches of each side of all fittings and valves. Vertical runs of pipe shall be supported independently of the connected horizontal runs. All vertical pipes shall be supported at each floor or at intervals not greater than ten feet, by approved pipe collars, clamps, brackets or wall rests. Hangers shall be placed on each side of a flexible coupling, as close to the coupling as possible. At expansion joints, hangers supporting the flexible couplings shall be placed on either side of the joint. Hangers shall prevent transverse movement.

SPACING SCHEDULE*, **

PIPE SIZE (INCH)	STEEL PIPE SCH. 20-80 (FEET)	STAINLESS STEEL (FEET)	COPPER PIPING (FEET)	DUCTILE IRON PIPE (FEET)	C/PVC PIPE (FEET)
½	5	-	5	-	3
¾	6	-	6	-	3
1	7	-	6	-	3.5
1 ½	9	-	8	-	3.5
2	10	10	9	6	4
2 ½	11	-	10	-	4.5
3	12	-	10	6.5	4.5
3 ½	13	-	11	-	-
4	14	10	12	8.5	5
6	17	10	14	9	6
8	19	10	14	10.5	6.5
10	22	10	15	12	-
12	23	10	17	13	6.5

* Additional supports and restraints at bends shall be installed for all pump system piping as necessary to prevent deformation and movement of the pipe under maximum flows and pressures.

** C/PVC pipe spacing schedule based on uninsulated pipe carrying liquid having a specific gravity of 1.0 and a temperature of 120 degrees Fahrenheit.

5. If the pipe to be supported is not listed, then the spacing for the next smaller pipe size shall be used. There shall be a minimum of one support per pipe lay length on uninterrupted horizontal runs. This support shall be placed within one foot of the joint. If the pipe manufacturer recommends a smaller spacing interval than specified herein, then the manufacturer's spacing shall be used.
6. All supports, saddles, bearing plates, and hangers shall provide by direct contact, a minimum of 80° support around the pipe, except as specified

INTERIOR PROCESS PIPING & VALVES
11200-10

herein. Where continuous concrete inserts are used, the maximum concentrated load on the end two inches of inserts, with laying lengths of eight inches or longer, shall not be more than 50 percent of the maximum recommended channel loading.

- B. Concrete pipe saddles shall cradle horizontal piping when it is supported from below. Where space limitation prevents using concrete pipe saddles, steel pipe saddles shall be used.
- C. Base elbows, tees and concrete pedestals shall be provided at all vertical runs of pipe and shall be supported on a base elbow and/or concrete pedestal. All concrete supports shall be formed up to the spring line of the pipe. After completion of curing, piping shall be adjusted to the proper grade.
- D. Pipe support framing system shall be designed by a qualified engineer retained by the Contractor and installed according to the design and per pipe manufacturer's recommended procedure. Pipe support and restraint system shall be designed to support the pipe's weight, pipe reaction from the flow and lateral seismic forces stipulated in the applicable provisions of the Massachusetts State Building Code, 8th edition.
 - 1. All pipe support and restrain framing system shall be hot dipped galvanized in conformance with ASTM A-123.
 - 2. All structural steel wide flanges, channel, angles and plate materials shall conform to ASTM A-36. All structural steel tubing shall conform to ASTM A-500 Grade B.
 - 3. Steel fasteners to conform to ASTM A-307 or A-325.
 - 4. Fittings shall be hot rolled steel, conforming to ASTM A-307 or ASTM A-575.
 - 5. All welding shall be performed by qualified welders and in conformance with applicable provisions of the AWS.
 - 6. When condition allows, metal framing system as manufactured by Uni-strut, Globe-Strut, Power Strut, or equal, may be used for supporting the piping system.
- E. Restraints
 - 1. All valves and fittings shall be restrained, so that all thrusts shall be supported independent of the piping system. Thrust shall not be supported by walls unless specifically designed for and indicated on Contract Drawings. All restraints shall conform to pipe manufacturer's recommendation.

INTERIOR PROCESS PIPING & VALVES
11200-11

2. For interior piping, restraints shall be located as follows:
 - a. Anchors shall be placed so all forces will be balanced.
 - b. Tie downs shall be used to hold the pipe in position where velocity and surge forces will cause pipe movement. They shall control stress due to thermal expansion at wall pipes, sleeves and equipment.
- F. Guides shall be used to prevent transverse motion at flexible couplings used as expansion joints.
1. Tie Rods: On piping, where flexible couplings are located near fittings or valves, stainless steel tie rods shall span the coupling from the two adjacent flanges. Such restraints can be deleted at the discretion of the Engineer, if both pipe ends are anchored in a concrete structure with no fitting or valve within the span. Where the Engineer intends to have flexible couplings used as expansion couplings, tie rods may be omitted. All tie rods shall be sized, spaced and installed according to the manufacturer's recommended procedure, or as directed by the Engineer.
 2. Restrained Joints: Where indicated on Contract Drawings, restrained joints shall be installed. Restraints shall be Megalug as manufactured by Ebaa Iron Co., or approved equal. Restraints for push-on joints shall be series 800 coverall as manufactured by Ebaa Iron Co., or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Handling of Pipe. The loading, hauling, unloading and handling of pipes and appurtenances shall be accomplished without damage to same. Dropping of pipe and appurtenances directly to the ground or floor will not be permitted. Suitable buffers or runners shall be provided. The Contractor shall be liable for any damage to the pipe or appurtenances until they are accepted in the completed work. Each pipe section shall be handled into its final position only in such a manner and by such means as the Engineer approves as satisfactory, and these operations will be restricted to those considered safe for the workmen and such as to cause no injury to the pipe or to any property. As far as practicable, the Contractor shall be required to furnish slings, straps, and/or approved devices to provide satisfactory support of the pipe when it is handled.
- B. Tools for Pipe Installation. The Contractor shall furnish all tools, torque wrenches, materials and labor necessary to make the joints in pipe in strict accordance with the manufacturer's specifications. Proper and suitable tools and appliances for the safe and convenient handling and installation of pipes shall be used. The Contractor shall exercise reasonable precaution during his operation in order to avoid damaging the material. All pipes, fittings or appurtenances which are so damaged shall be replaced by him at his sole expenses.

INTERIOR PROCESS PIPING & VALVES 11200-12

- C. Installation. All materials and equipment shall be installed in a neat workmanlike manner, and as recommended by the manufacturer. All piping shall be installed true to line and grade and rigidly supported. Before setting wall sleeves and pipes to be cast-in-place, the Contractor shall check all plans and figures which may have a direct bearing on his pipe location and he shall be responsible for the proper location of his pipes during the construction of the buildings. All interior piping shall have sufficient number of unions or their equivalent to allow convenient disassembly and removal of piping. All valves and appurtenances shall be installed in accordance with manufacturer's directions at locations shown on the drawings. All in-line devices provided under instrumentation shall be installed as part of the work of this section.
- D. Cleaning and Plugging Pipe. The pipes and fittings shall be thoroughly cleaned before being installed and shall be kept clean until accepted in the finished work. The ends of all uncompleted lines shall be tightly closed with temporary plugs at all times when pipe installation is not in progress to prevent foreign material from entering the pipe.
- E. Screwed Connections. All threads shall be clean, machine cut, and all pipe shall be reamed before erection. Screwed joints shall be made up with good quality thread compound applied to the male thread only. After having been set up, a joint must not be backed off unless the joint is completely broken, the threads cleaned and new compound applied. Teflon tape or teflon compound may be used for steel, polyvinyl chloride, chlorinated polyvinyl chloride and copper threaded connections.
- F. Arrangements. Except as otherwise required, changes in direction shall be made using proper fittings, and unless shown otherwise piping shall run parallel and at right angles to walls and floors. Systems shall be arranged with low points and drains to permit complete drainage of the system. Control piping may be arranged with unions or union connections at low points to permit draining. Unions or flanges shall be provided close to main pieces of equipment and in branch lines to permit ready dismantling of piping without disturbing main pipe lines or adjacent branch lines.
- G. Penetrations. All penetrations in walls, floors and ceilings shall be sealed watertight and/or gastight to the satisfaction of the Engineer.
- H. Prior to installation, protect stored valves and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.
- I. Clean all debris, dirt, gravel, etc, from inside of piping before placing valves in place.
- J. Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material. Clean out debris and foreign material from valve openings and seats, test operating mechanisms to check proper functioning, and check nuts and bolts for tightness. Repair, valves and other equipment which do not operate easily or are otherwise defective.

INTERIOR PROCESS PIPING & VALVES

11200-13

- K. Set plumb and support valves adequately in conformance with instructions of manufacturer. Shim valves mounted on face of concrete vertically and grout in place. Install valves in control piping for easy access.
 - L. Provide valves with extension stems where required for convenience of operation. Provide extension stems for valves installed low to the ground and elsewhere so that operating wrench does not exceed 6 ft. in length.
 - M. Provide chain wheel operators on all valves 2-in., and larger where handwheel or lever exceeds 6-ft., 6-in. above floor or operating platform. Provide geared operator where required to position chainwheel in vertical position.
 - N. Chain of chain operators to extend within 3 ft. of operating floor. Provide two S-shaped hooks for each chain to enable chain to be hooked away from personnel traffic.
- 3.2 Plastic Piping (PVC). The installation of plastic pipe for pressure service shall be strictly in accordance with the manufacturer's technical data and printed instructions and as follows:
- A. General. The solvent welding procedure detailed herein applies to all Polyvinyl Chloride (PVC) pressure piping systems including molded fittings and socket type pump and valve connections.
 - B. Cement. Shall be a grade specifically recommended by the piping manufacturer for the size and schedule of pipe specified.
 - C. Pipe Preparation.
 - 1. Cutting. Pipe shall be cut in accordance with the recommendations of the pipe manufacturer.
 - 2. Deburring and Beveling. All burrs, chips, filings, and the like shall be removed from both the pipe inside diameter and outside diameter before joining. All pipe ends shall be beveled approximately 1/16-inch to 3/32-inch back from the edge at an angle of 10 to 15 degrees.
 - D. Fitting Preparation. Prior to solvent welding, all fittings and couplings shall be removed from their cartons and exposed for at least one hour to the same temperature conditions as the pipe in order to assure that they are thermally balanced before joining.
 - E. Cleaning. Pipe and fittings shall be clean of all loose dirt and moisture from the inside diameter and outside diameter of the pipe end and the inside diameter of the fitting. **DO NOT ATTEMPT TO SOLVENT WELD WET SURFACES.**

INTERIOR PROCESS PIPING & VALVES
11200-14

- F. Priming. Apply primer to the pipe approximately one-half (1/2 of the pipe diameter and in accordance with the manufactures recommendations). Apply primer freely in the socket keeping surface wet and applicator wet and in motion 5 to 15 seconds. Avoid puddling in socket. For checking penetration, you should be able to scratch or scrape a few thousandths of the primed surfaces away. Repeated applications to either or both surfaces may be necessary. Weather conditions do affect priming action. In cold weather more time is required for proper penetration.
- G. Solvent Cement Application. Solvent cement application shall be in accordance with the manufactures recommendation with a minimum of two coats. All excess cement shall be cleaned from the surfaces of the pipe and fittings.
- H. Joining. Joining of PVC pipe and fitting shall be in accordance with the manufacturer's recommendations and only at the below solvent welding joining temperatures and joint drying times:
 - 1. The actual joining should not be done in atmospheric temperatures below 40°F or above 90°F, or when exposed to direct sunlight.
 - 2. Not less than 48 hours of joint drying time shall elapse for all sizes of pipe and drying temperatures before the joint is moved or subjected to any appreciable internal or external pressure.

Note: Joints for plastic pipe shall be solvent welded except flanged or screwed where required. For plastic to steel, cast iron pipe or ductile iron pipe connections, complete metal pipe assembly first. Use flanged connections and tighten bolts evenly to prevent warping of rigid plastic pipe. A torque wrench may be used for a tight seal on gasket. Joints shall conform to manufacturer's recommendations installation of valves and fittings shall be strictly in accordance with manufacturer's instructions. In making solvent weld connections, the solvent should not be spilled on valves or allowed to run from joints. All completed pipe lines shall remain undisturbed for 48 hours to develop complete strength at all joints.

3.3 STAINLESS STEEL PIPING

- A. Cleaning: All equipment, piping, valves, instruments, and accessories shall be cleaned in compliance with the Compressed Gas Association (CGA) Pamphlet G-4.1, "Cleaning Equipment for Oxygen Service", latest edition. For items cleaned prior to shipment to the construction site, they shall be properly packaged and stored to protect from contamination. Pre-cleaned items shall be provided a final cleaning/purge with all piping and appurtenances installed.
- B. Welding

INTERIOR PROCESS PIPING & VALVES 11200-15

1. Perform in accordance with Section IX, ASME Boiler and Pressure Vessel Code and ASME A: B31.1 for Pressure Piping, and if recommended by piping or fitting manufacturer.
2. Weld Identification: Mark each weld with symbol identifying welder.
3. Pipe End Preparation:
 - a. Machine Shaping: Preferred.
 - b. Oxygen or Arc Cutting: Smooth to touch, true, and slag removal by chipping or grinding.
 - c. Beveled Ends for Butt Welding: ASME B16.25.
4. Surfaces:
 - a. Clean and free of paint, oil, rust, scale, slag, or other material detrimental to welding.
 - b. Clean stainless steel joints with stainless steel wire brushes or stainless steel wool prior to welding.
 - c. Thoroughly clean each layer of deposited weld metal, including final pass, prior to deposition of each additional layer of weld metal with a power-driven wire brush.
5. Alignment and Spacing:
 - a. Align ends to be joined within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness.
 - b. Root Opening of Joint: As stated in qualified welding procedure.
 - c. Minimum Spacing of Circumferential Butt Welds: Minimum four times pipe wall thickness or 1 inch, whichever is greater.
6. Climatic Conditions:
 - a. Do not perform welding if there is impingement of any rain, snow, sleet, or high wind on the weld area, or if the ambient temperature is below 32 degrees F.
 - b. Stainless Steel and Alloy Piping: If the ambient is less than 32 degrees F, local preheating to a temperature warm to the hand is required.
7. Tack Welds: Performed by qualified welder using same procedure as for completed weld, made with electrode similar or equivalent to electrode to be used for first weld pass, and not defective. Remove those not meeting requirements prior to commencing welding procedures.
8. Surface Defects: Chip or grind out those affecting soundness of weld.
9. Weld Passes: As required in welding procedure.

INTERIOR PROCESS PIPING & VALVES
11200-16

10. Weld Quality: Free of cracks, incomplete penetration, weld undercutting, excessive weld reinforcement, porosity slag inclusions, and other defects in excess of limits shown in applicable piping code.

3.4 TESTING OF PROCESS PIPING AND VALVES

- A. General. All piping and piping systems shall be leak tested by the Contractor in the presence of the Engineer. The Contractor shall provide typed and witnessed test reports for all such tests. All piping and piping systems not complying with the leak test shall be repaired or replaced by the Contractor to the satisfaction of the Engineer and be re-tested all at no additional cost to the Owner.
 1. After the pipelines have been completed and all supports and restraints have been installed, the Contractor shall perform all pressure tests. The Contractor shall be responsible for furnishing all labor, materials, and equipment so that such tests can be accomplished at the time locations necessary.
 2. All lines shall be hydrostatically tested for a period of two consecutive hours. The test pressure shall be 150 psi or 2 times the apparent working pressure, whichever is the greater.

3.5 VALVE FIELD TESTING

- A. All valves tested in conjunction with hydrostatic testing of the respective piping.
- B. Test all valves' smoothness of operation after installation, and make any necessary adjustments, repairs or replacements.

3.6 SHOP PAINTING

- A. Both the inside and outside surfaces of all ferrous materials, equipment, and devices shall be thoroughly cleaned at the shop.
- B. All ferrous parts/components, except machine surfaces and others obviously not to be painted, and as otherwise specified hereinbefore (including referenced AWWA Standards), shall be furnished with primer coats of rust inhibitive primer compatible as specified in Division 9 – Finishes. Where applicable, surface preparation and primer coating shall be as specified in Division 9 – Finishes. All machined surfaces subject to corrosion shall be coated with a rust preventer/inhibitor prior to shipment. Contractor shall follow Manufacturer's recommendations for preventing corrosion prior to installation and operation.

3.7 PAINTING

- A. As specified in Division 9.

INTERIOR PROCESS PIPING & VALVES 11200-17

3.8 PIPING IDENTIFICATION

- A. Piping shall be stenciled to match existing and otherwise as specified in Division 9.

3.9 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 11200

INTERIOR PROCESS PIPING & VALVES
11200-18

SECTION 11305

FLOODED SUCTION PUMP

PART 1 GENERAL

1.1 RELATED DOCUMENT

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions, Division 0 and Division 1 Specification Sections, apply to this section.

1.1 SUMMARY OF WORK

- A. Provide all labor, equipment and materials necessary to furnish, install, test and place in operation two (2) vertically-mounted, close-coupled motordriven, immersible, non-clog type centrifugal pumping unit at the Far Reach Road Pump Station, as shown on the plans and as specified herein.
- B. Unit shall be furnished with pump, pedestal base, suction elbow, driver, motor support base with guard, along with necessary steady bearing(s) and shaft guards, and other ancillary equipment specified herein.
- C. Related sections include the following:
 - 1. Division 16 – Electrical

1.2 REFERENCES

- A. AFBMA (Anti-Friction Bearing Manufacturer Association)
- B. HIS (Hydraulic Institute Standards - 1990)
- C. ANSI (American National Standards Institute)
- D. ISO (International Organization for Standardization)
- E. ASTM (American Society of Testing and Materials)
- F. National Electric Code
- G. Underwriters Laboratories (UL)

1.3 SYSTEM DESCRIPTION

- A. Wastewater pumps to be replaced at the Far Reach Road Pump Station.

FLOODED SUCTION PUMPS
11200-1

- B. Pumping units shall be connected to individual suction lines that draws sewage from the pump station wet well.
- C. Wastewater is discharged from pumps, through new check valves and gate valves, to a common discharge pipe header to the force main.
- D. Pump will be controlled by the existing wet well level control PLC.
- E. Pumps shall be automatically started and automatically stopped at predetermined levels, adjustable through SCADA.

1.4 SUBMITTALS

A. General

1. Comply with the pertinent provisions of Section 01300 - Submittals.

B. Quality Assurance/Control Submittals

1. A statement from the manufacturer that the pump will function properly as installed with respect to the suction piping layout as shown on the Drawings.
2. A "Letter of Compliance" from the manufacturer stating that the characteristics of the pump (specifically naming the respective pump), is such that it will not overload the specified motor horsepower under any head condition when operating at the specified maximum speed, and that the motor will not overheat at maximum turndown.
3. A certificate from the pump manufacturer stating that the installation of the pumping unit is satisfactory, that the equipment is ready for operation, and that the operating personnel have received operation and maintenance training.

C. Shop Drawings

1. Manufacturer's rating curves showing pump characteristics of discharge, head, capacity, brake horsepower, efficiency, required net positive suction head, and required minimum submergence.
2. Submit multiple pump curves covering speed ranges for the proposed pump. Each curve shall plot total dynamic head (ft) versus flow rate (gpm), horsepower versus flow rate (gpm), and efficiency versus flow rate (gpm). This information shall be prepared specifically for the pump proposed.
3. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction, and total pumping unit

FLOODED SUCTION PUMPS 11200-2

weight. This information shall be prepared specifically for the pump proposed. Catalog sheets showing a family of curves will not be acceptable.

4. Details of fabrication, erection, and adjoining equipment interfaces for all equipment furnished under this section, along with dimensional drawings of each item of equipment and auxiliary apparatus to be furnished.
5. Certified foundation, pump support, and anchor bolt plans and details.
6. Certified motor test data.
7. Submit manufacturer's electrical requirements for pumps including laddertype wiring diagrams for interlock and control wiring, clearly indicating required field connections.
8. Bearing life calculations.
9. Equipment start-up reports.
10. Operation and Maintenance Manuals

D. Factory Tests

1. Hydraulics
 - a. Certified factory test data including performance curves for each of the proposed pumps from shut off to maximum capacity, showing total dynamic head, hydraulic and overall (wire-to-water) efficiency, brake horsepower, required NPSH, and minimum submergence.
 - b. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition. Pumps shall be hydrostatically tested for a pressure equal to two times the shut-off head. Results of the performance tests including data and test points shall be certified by a Registered Professional Engineer and submitted for approval before final shipment.
2. Vibration tests shall be performed per manufacturer's recommendations. Certified copies of the test results shall be submitted to the Engineer for approval prior to shipment.

1.5 QUALITY ASSURANCE

A. General

1. These specifications direct attention to certain features of the pumping unit, but do not purport to cover all of the detail of its design. The equipment furnished shall be designed and constructed equal to high-quality pumping

FLOODED SUCTION PUMPS
11200-3

equipment manufactured by such firms as are mentioned hereinafter for the various type of pumps, or those approved by the Engineer.

B. Manufacturer

1. The plans and specifications have been prepared based on the Smith & Loveless, Inc. flooded suction immersible non-clog pump I-Series™ 4C3. The Town has preselected Smith & Loveless as the Manufacturer of this pump. No other pump Manufacturer shall be accepted.

C. Coordination

1. The pumping unit required under this Section shall be complete including pumps, motors, and intermediate shafting. The pump manufacturer shall be responsible for the furnishing and performance of all equipment.
2. The Contractor and pump manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system including but not limited to the pumps, motors, starters and shafting, as specified.
3. The pump manufacturer shall coordinate with the motor manufacturer to assure a matched and working system.
4. The Contractor shall ensure that the pump and motor, and shafting manufacturers coordinate all equipment being provided.
5. The pumping equipment shall be adequately and safely designed and constructed for heavy-duty use and continuous operation at the pressures and under all conditions of service to which they may be subjected.

1.6 DELIVERY, STORAGE AND HANDLING

- A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation. On-site precautions must be taken by the Contractor to ensure adequate protection during storage.

1.7 SPARE PARTS

- A. Furnish with the pump and drive, the manufacturer's standard set of spare parts including at least the following:
 1. One (1) set of pump casing gaskets.
 2. One (1) set of mechanical seals.
 3. One (1) shaft sleeve with keys, nuts, and o-rings.

FLOODED SUCTION PUMPS
11200-4

4. One (1) set of wearing rings for each pump.
 5. One (1) set of radial and thrust bearings.
 6. One (1) set of set screws.
 7. One (1) set of replaceable elements for shaft couplings.
 8. One (1) stuffing box throat bushings.
- B. Spare parts shall be furnished packed in suitable containers and clearly labeled designating the contents and the unit for which they are intended. A minimum of one quart of touch-up paint shall be provided with the equipment.
- C. Furnish all special tools required for the maintenance of the new pumps.
- D. Lubricants - Prior to testing and acceptance, furnish a one year's supply of all lubricants recommended by the manufacturers of each component of the equipment furnished and installed.

1.8 OPERATION AND MAINTENANCE MANUALS

- A. Provide O&M Manuals and Equipment Start-up Reports for all equipment and components specified in this section.

PART 2 PRODUCTS

1.1 GENERAL

- A. Parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially constructed for the work to be done. Ample room and facilities shall be provided for inspection, repairs, and adjustment.
- B. All necessary foundation bolts, plates, nuts, and washers, shall be furnished. Anchor bolts shall be 316 stainless steel, sized by the equipment manufacturer.
- C. Brass or stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, and all other pertinent data shall be attached to each pump and motor. A special data plate shall be attached to the pump frame, which shall contain identification of frame and bearing numbers.
- D. The pumps shall operate throughout the entire operating range, within the vibration limits specified herein.

1.2 PERFORMANCE DATA

FLOODED SUCTION PUMPS 11200-5

- A. Each pump shall be designed for the wastewater conditions of service as shown below:

Design Flow (gpm)	150
Design TDH (ft)	66
Min. Shut Off Head (ft)	70
Max Motor Speed (rpm)	1800
Max Motor HP	7.5

1.3 PUMP CONSTRUCTION

A. Casing

1. The pump casing shall be a one-piece volute type with integral discharge nozzle. The volute casing shall be dual-curved to reduce radial thrust.
2. The casing shall be designed for handling raw sewage and shall be of cast iron conforming to ASTM A48 (ASTM A278), Class 30 or better, of minimum 3/4" nominal thickness, and suitably ribbed to withstand all stresses and strains of service at full operating pressure. Each casing shall be hydrostatically tested to twice the shut-off pressure, provided with vent, drain, and gauge connections.
3. The volute shall be oriented with suction and discharge to match existing piping configuration. Contractor and Manufacturer to coordinate and field verify existing conditions and dimensions to ensure precise fit within the existing piping configuration.
4. No stationary guides or splitters will be permitted on either the suction or discharge sides of the casing.
5. The casing shall be provided with tapped and plugged (removable) vent (1-inch), drain, and gauge connections.
6. Two lifting eyes minimum shall be furnished to facilitate handling.
7. The discharge connection shall be a 125 lb. American standard raised face flange positioned as indicated on the Drawings.

B. Suction Elbow and Backplate

FLOODED SUCTION PUMPS 11200-6

1. The suction elbow and backplate shall be of the same material as the casing, cast separate from the volute.
2. Increasing suction elbow shall be provided as the nominal pump size is smaller than the suction line.
3. The suction and backplate shall be shoulder fitted to the casing and assembled with studs to assure accurate alignment.
4. A 2" tapped hole shall also be provided in the side of the elbow for use in applying water pressure to unclog the pump in case of blockage.
5. The pump suction shall have 125-pound standard raised face flanged and shall be provided without the use of pipe adapters. Standard commercial fittings shall not be substituted.

C. Impeller

1. The impeller shall be balanced non-clogging type made of close-grained cast iron conforming to ASTM A48 (ASTM A278) Class 30 or better. The impeller shall be cast in one piece and shall be dynamically balanced. Rotation of the impeller shall correspond to the pump discharge orientation as indicated on the Drawings.
2. The impeller shall be single suction, enclosed, two or four vane, radial flow design with well-rounded leading vanes and then tapered toward the trailing edge for a circular flow pattern. The design of the impeller and the shape of the blades shall be such that rags or similar materials will not clog the pump or seriously affect the efficiency. The waterways through the impeller shall have extremely smooth contours, devoid of sharp corners, to prevent rags or stringy, fibrous material from catching or clogging.
3. Impeller shall be designed to minimize clogging and shall be capable of passing a minimum 3" diameter solid sphere.
4. The impeller shall be keyed to the shaft and firmly held in place by a streamlined 316 stainless steel locking device. The arrangement shall be such that the impeller cannot be loosened by torque from either forward or reverse rotation.

D. Mechanical Seal

1. The pump shaft shall be sealed against leakage by a double mechanical seal installed in a bronze seal housing constructed in two (2) sections with registered fit.

FLOODED SUCTION PUMPS
11200-7

2. The housing shall be recessed into the pump back head and securely fastened thereto with stainless steel cap screws. The inside of the seal housing shall be tapered to facilitate the replacement of the seal parts.
3. The seal shall be a double seal, with the mating surfaces lapped to a flatness tolerance of one light band.
4. The rotating member shall be held in mating position with the stationary carbons by a stainless steel spring.
5. The seal housing with assembled parts shall be so constructed as to be readily removable from the shaft as a unit, and shall be provided with tapped jackscrew openings to assist in removing it from the back head.

E. Pump Bearings

1. The pump shall be provided with radial and thrust anti-friction ball or tapered-spherical roller type bearings of ample size to carry all loads imposed under continuous operation without overheating.
2. The bearing housing shall be of dust-proof design, incorporating lip-type grease seals in contact with the shaft to prevent the entrance of contaminants.
3. The bearings shall be grease lubricated and a relief port lip seal shall be provided so that excessive grease pressure will not damage the bearings. The bearings shall be provided with tapped openings for the addition of lubricant and draining.
4. The bearings shall be designed in accordance with AFBMA standards for a minimum B-10 life of 40,000 hours at the most extreme operating points on the pump performance curve and a minimum of 100,000 hours at the primary duty point.

F. Bearing Frame

1. The pump bearing frame shall be made of ASTM A48 Class 30 cast iron material. The bearing frame shall be shoulder fitted, accurately centered and rigidly fixed to the pump casing and backplate. The bearing frame shall contain jacking bolts and shims for the axial adjustment of the rotating element when necessary to provide the manufacturer's recommended clearance between the impeller and suction cover over the life of the pump.
2. The pump bearing frame shall be designed so that the complete rotating element can be removed from the pump casing without disconnecting of the suction or discharge piping.

G. Pump Support

FLOODED SUCTION PUMPS
11200-8

1. The base shall be fabricated of steel or integrally cast with the suction elbow.
2. The base shall be anchored to the existing concrete pad using a minimum of four stainless steel anchor bolts.
 - a. Surface damage to existing concrete pad shall be repaired and made level where necessary by use of TNEMIC Series 217 MortarCrete or Equal.
3. Support shall provide easy access to the stuffing box, bearing frame, and coupling.
4. Base shall have adequate horizontal dimensions, foundation contact area, anchorage facilities and shall be of sufficient height so that the suction elbow will not touch the floor or foundation upon which the pump is mounted.
5. The pump support system shall be of sufficient size, strength, and rigidity to support the unit and prevent harmful or damaging vibration. Base shall safely withstand all stresses imposed thereon by vibration, shock and all possible direct and eccentric loads.
6. Pump base / stand shall be customized to ensure pump suction and discharge ends lines up within the existing piping configuration. Contractor to field verify dimensions and coordinate with Manufacturer.

2.5 SHAFTING

- A. The pump shaft shall be made from high grade heat treated alloy steel, rigid shaft type, of sufficient size to transmit the full driver horsepower with a liberal safety factor, accurately machined over its entire length and free from any harmful or damaging vibrations. The pump shaft shall include a tapered end for positive alignment and ease of removal at the impeller hub.

2.6 MOTOR

- A. Motor shall be 7.5 HP/1800 RPM premium efficiency rated for 3 phase, 460 volts, 60 hertz electrical service and shall conform to all applicable requirements of Div. 16.
- B. Motors shall be inverter rated duty.
- C. The motors shall have capacity sufficient to operate the pumps throughout the operating range without exceeding the nameplate rating for current and power, unless otherwise is specifically indicated.
- D. Motors shall be provided with radial keyways to absorb thrust caused by shafting.

FLOODED SUCTION PUMPS 11200-9

- E. Motor shall be provided with lifting lugs.
- F. Immersible Motor
 - 1. The motor shall be immersible for up to three (3) weeks at a depth of thirty feet (30') of water without damage from leakage.
 - 2. Motor shall be capable of operating in an immersed state without damage to the pump or motor.
 - 3. After returning from an immersed state, the motor shall be capable of being restarted without any service to the motor.
 - 4. The upper and lower shaft extensions shall be sealed with specially designed PTFE rotating lip seals and all casting-to-casting interfaces shall be sealed with Viton O-rings.
 - 5. Leads shall be terminated in a cast connection box, designed to exclude moisture, and all leads shall be clearly identified.
 - 6. Where required for sealing, all bolts shall be provided with Neoprene-backed washers.
 - 7. A slinger ring shall be provided on the lower shaft extension to further reduce the possibility of water entering the motor.
 - 8. Each motor shall have at least one (1) normally closed, automatically resetting thermostat per phase, suitable for a 120 VAC 2-amp load.

2.7 MOTOR SUPPORT

- A. The motor shall be mounted and supported by a fabricated steel support stand with adequately sized service openings providing easy access to the coupling flange. The support shall be ribbed as necessary to prevent excessive deflection.

2.8 SURFACE PREPARATION AND PAINTING

- A. Surface preparation and prime and finish painting is provided under this Section. Surface preparation shall be SSPC-SP6, commercial blast. Shop prime and finish coating systems shall be the manufacturer's recommended coating systems for the intended service.
- B. A minimum of one quart of touch-up paint shall be provided with the equipment.

PART 3 EXECUTION

FLOODED SUCTION PUMPS 11200-10

3.1 INSTALLATION

- A. Installation of pumps, pipes, valves and appurtenances by the General Contractor shall be strictly in accordance with the recommendations and instructions of the manufacturer and located as shown on the Drawings or as approved by the Engineer. Supervision of installation and testing of equipment by the manufacturer's representative shall be provided in accordance with the requirements of this Section.
- B. It shall be the responsibility of the Contractor to coordinate the work included under this Section with other related work specified herein to ensure that all the equipment shall operate to perform the designated functions in a proper and acceptable manner.
- C. Level base by means of steel wedges (steel plates and steel shims). Wedge taper not greater than ¼ inch per foot. Use double wedges to provide a level-bearing surface for the pump and driver base. Accomplish wedging so that there is no change of level or springing of the baseplate when the anchor bolts are tightened.
- D. Adjust pump assemblies such that the driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings. Do not compensate for misalignment by use of flexible couplings.
- E. After the pump and driver have been set in position, aligned, and shimmed to the proper elevation, grout the space between the bottom of the baseplate and the concrete foundation with a poured, non-shrinking grout of the proper category. Remove wedges after grout is set and pack void with grout.
- F. After the complete pumping units and appurtenant equipment have been installed, and the units have been inspected, tested, adjusted and placed in proper operating condition under the direct observation of the pump manufacturer's representative, the pumping equipment shall be field-tested by the Contractor in the presence of the Engineer. The tests shall demonstrate fitness for the service specified and the ability of the pumping units to operate without vibration or overheating when operated to meet the performance requirements specified.
- G. Connect suction and discharge piping without imposing strain to pump flanges.
- H. Anchor bolts shall be accurately placed using equipment templates.

3.2 FIELD QUALITY CONTROL

- A. General
 - 1. Testing shall not be conducted until such time that installation is complete and ready for testing.
 - 2. The manufacturer shall provide a factory trained technician for a minimum of one four-hour day of field service for installation and start-up supervision, as

FLOODED SUCTION PUMPS
11200-11

specified in Section 11000. Services shall include, but not necessarily be limited to, inspection of the completed installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, and supervision of all testing.

B. Performance Testing

1. Pumps shall be field tested at a minimum of seven head/capacity points including shutoff head and maximum capacity as required to ensure pumps are tracking along the certified pump curve. Provide submittal with test results.
2. Each of the pumps shall be run at maximum capacity for 24 hours (without malfunction) prior to acceptance.
3. Record driving motor voltage and amperage measured for each phase.
4. Adjust, realign, or modify units and retest, if necessary.
5. All defects or defective equipment revealed by or noted during the performance testing shall be corrected or replaced promptly at the expense of the Contractor, and, if necessary, the tests shall be repeated until satisfactory results are obtained. The Contractor shall furnish all labor, piping, equipment and materials necessary for testing.

- C. In the event the equipment fails to meet any of the requirements specified above, the necessary changes shall be made and the equipment retested. If the equipment remains unable to meet the specified requirements to the satisfaction of the Owner, the equipment shall be removed and replaced with satisfactory equipment at no cost to the Owner.

3.3 MANUFACTURER'S SERVICES

- A. The Contractor shall be responsible for coordinating the services of a qualified field service engineer provided by the manufacturer for start-up, inspection, and testing.
- B. The Contractor shall provide the Owner with a minimum 7 days written notice of planned operator training.
- C. The manufacturer's representative shall inspect, operate, test, and adjust the equipment after installation has been completed and the equipment is presumably ready for operation, but before it is operated by others. At a minimum, include the following points in the inspection:
 1. Soundness (without cracked or otherwise damaged parts).
 2. Completeness in all details, as specified.
 3. Correctness of setting, alignment, and relative arrangement of various parts.

FLOODED SUCTION PUMPS 11200-12

4. Adequacy and correctness of packing, sealing and lubricants, etc.
- D. The manufacturer's representative shall operate, test, and adjust equipment to prove that it is left in proper condition for satisfactory operation under the conditions specified.
- E. The manufacturer's technician shall prepare a written report specifying that the equipment is installed according to the manufacturer's recommendations and is ready for permanent operation. The report shall also confirm that nothing in the installation will render the manufacturer's warranty null and void.
- F. The manufacturer shall provide the services of a factory-trained technician to train the Owner on the operation, calibration and maintenance of equipment supplied under this Section.
- G. A minimum of one (1) day of field service shall be provided by an authorized, factory trained representative of the pump manufacturer for installation and start-up supervision. Services shall include, but not necessarily be limited to, inspection of the completed installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, and supervision of all field testing.
- H. A manufacturer's field service representative shall be provided for a separate additional period of one day, to provide operator training in the operation and maintenance of all equipment provided under this Section, as well as activation of the Warranty.
- I. Training shall be conducted separate from the specified start-up, and a total minimum number of on-site visits required by the pump representative shall be two (2) days in total.

3.4 WARRANTY

- A. The manufacturer of the pumping units shall provide a written warranty covering each entire pumping unit as described herein.
- B. In the event of problems caused by defects in materials and/or workmanship, the Manufacturer and the Contractor shall promptly repair or replace the defective materials or workmanship at no cost to the Owner.
- C. Final Acceptance of all equipment furnished under these Specifications will be withheld until after the installation and field testing by the Contractor in the presence of the Owner. The Manufacturer shall guarantee the equipment against defects of any kind for a period of five (5) years after final testing and acceptance and shall cover 100% of the cost of repairs for parts and labor.

END OF SECTION

FLOODED SUCTION PUMPS

11200-13

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SECTION 11310

ACCESS HATCH GRATING

PART 1 - GENERAL

1.1 SUMMARY OF WORK

- A. The Work covered under this Section of the Specifications includes furnishing all equipment, components, accessories, materials, and appurtenances, for design, and installation for the wet well access hatch safety grating system as shown on the Contract Drawings and as specified herein.

1.2 SUBMITTALS

- A. Submit manufacturer's product data.
- B. Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.
- C. Submit executed copy of manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

- A. Manufacturer: A minimum of 5 years experience manufacturing similar products.
- B. Installer: A minimum of 2 years experience installing similar products.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The available manufacturers are:
 - 1. BILCO Company Engineer, or approved equal.

2.2 FALL PROJECTION GRATING SYSTEM

- A. Furnish and install on wet well access hatch, where indicated on plans, fall protection grating system. Door manufacturer shall install the grating system when the door is

ACCESS HATCH GRATING

11310-1

fabricated or field install (by others) on existing doors already in use. If field installation is necessary, grating system shall be installed per the manufacturer's instructions.

- B. Performance characteristics:
 - a. Grating panel(s) shall be high visibility safety yellow in color.
 - b. Grating panel(s) shall lock automatically in the full open position.
 - c. Grating system shall have a twenty-five year warranty.
 - d. Grating panel(s) shall have a provision for locking to prevent unauthorized opening.
- C. Grating: Panels shall be aluminum with a powder coat paint finish and designed to meet OSHA OSHA 29 CFR 1926.502(c) requirements for fall protection.
- D. Hold open feature: A Type 316 stainless hold open device shall be provided to lock the cover in the fully open 90 degree position.
- E. Hardware: All hardware shall be Type 316 stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
 - a. Test units for proper function and adjust until proper operation is achieved.
 - b. Repair finishes damaged during installation.
 - c. Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

- A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION 11310

ACCESS HATCH GRATING
11310-2

SECTION 11501
PROCESS GAUGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions, Division 0 and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY OF WORK

- A. The Work covered under this Section of the Specifications includes furnishing all equipment, components, accessories, materials, and appurtenances, and providing technical assistance for design, installation, and startup for complete process gauges system as shown on the Contract Drawings and as specified herein.

- 1. The Contractor shall furnish process gauges where shown on the Contract Drawings and as specified herein.
- 2. The Contractor shall be responsible for delivery and unloading of the process gauges system as noted below.
- 3. All required labor, materials and equipment shall be included.

- B. Related sections includes the following:

- 1. Division 1 – General Requirements
- 2. Division 11 – Equipment

1.3 SUBMITTALS

- A. The Contractor shall submit shop drawings for all components of the pressure gauges in accordance with Division 1.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – Quality Assurance and as specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

PROCESS GAUGES
11501-1

- A. The available manufacturers are:
 - 1. AMETEK, Inc.; U.S. Gauge Div.
 - 2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
 - 3. Trerice, H. O. Co.
 - 4. WIKA Instrument Corporation.
 - 5. Or Engineer Approved Equal.

2.2 SERVICE CONDITIONS

- A. Each component shall be designed for the environmental conditions of the space in which the component is located.
- B. Indoor areas will be mechanically ventilated. Temperatures in the equipment areas will be between 50 and 100 degrees F, and relative humidity may be as high as 100 percent. The wet side of the building exhibits a highly corrosive environment due to elevated levels of hydrogen sulfide (H₂S) related to municipal sewage. All components in the wet side (classified area) of the building shall meet Class 1, Division 1 requirements.

2.3 DIRECT MOUNTING, DIAL TYPE PRESSURE GAUGES

- A. All pressure gauges shall be of the indicating-dial type in accordance with ASME Designation B40.100.
 - 1. The case shall be of the liquid-filled type, drawn steel or cast aluminum, 4-1/2 inches in diameter.
 - 2. The pressure-element assembly shall be of the Bourdon tube, unless otherwise indicated.
 - 3. The pressure connection shall be brass, NPS 1/4, bottom-outlet type unless the back-outlet type is indicated.
 - 4. The movement shall be mechanical with a link to the pressure element and connection to pointer.
 - 5. The dial shall be satin-faced, non-reflective aluminum with permanently etched scale markings.
 - 6. The pointer shall be red metal.
 - 7. The window shall be glass.

PROCESS GAUGES 11501-2

8. The ring shall be metal.
9. The accuracy shall be Grade A, plus or minus one (1) percent of middle half scale.
10. The vacuum-pressure range shall be 30-inches of mercury of vacuum to 15 psig of pressure.
11. The range for fluids under pressure shall be two (2) times the operating pressure.
12. Provide diaphragm seals for liquid piping to prevent the gauge from being clogged or corroded by process materials.

2.4 REMOTE MOUNTING, DIAL TYPE PRESSURE GAUGES

- A. All pressure gauges shall be of the indicating-dial type in accordance with ASME Designation B40.100.
 1. The case shall be of the liquid-filled type, drawn steel or cast aluminum, 4-1/2 inches in diameter.
 2. The pressure-element assembly shall be of the Bourdon tube, unless otherwise indicated.
 3. The pressure connection shall be brass, NPS 1/4, bottom-outlet type unless the back-outlet type is indicated.
 4. The movement shall be mechanical with a link to the pressure element and connection to pointer.
 5. The dial shall be satin-faced, non-reflective aluminum with permanently etched scale markings.
 6. The pointer shall be red metal.
 7. The window shall be glass.
 8. The ring shall be metal.
 9. The accuracy shall be Grade A, plus or minus one (1) percent of middle half scale.
 10. The vacuum-pressure range shall be 30-inches of mercury of vacuum to 15 psig of pressure.
 11. The range for fluids under pressure shall be two (2) times the operating pressure.
 12. Provide diaphragm seals for liquid piping to prevent the gauge from being clogged or corroded by process materials.

PROCESS GAUGES 11501-3

2.5 PRESSURE-GAUGE FITTINGS

- A. The valves shall be NPS ½” or ¼” stainless steel ball valve.
- B. The snubbers shall be in accordance with ASME Designation B40.5, NPS ¼” stainless steel with corrosion resistant, porous metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 GAUGE APPLICATIONS

- A. The Contractor shall furnish and install pressure gauges at the suction and discharge of each pump.
- B. The Contractor shall furnish and install pressure gauges where noted on the Contract Drawings and as specified in other sections.

3.2 INSTALLATION

- A. The Contractor shall furnish ball valves and snubber fitting in the piping for each pressure gauge in accordance with the Manufacturer’s written instructions, Contract Drawings, and as specified herein.
- B. The Contractor shall provide diaphragm seal protection for all wastewater and chemical feed system applications.

3.3 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 - Contract Closeout.

END OF SECTION 11501

PROCESS GAUGES
11501-4

DIVISION 16

ELECTRICAL

INDEX

<u>Section</u>	<u>Title</u>	<u>Page</u>
16000	Electrical Work	16000-1

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SECTION 16000

ELECTRIC WORK

1 PART 1 GENERAL

1.01 DESCRIPTION

A. Work Included: Under this Section, the Contractor shall provide all plant, labor, materials, services and equipment required to complete all items of power and auxiliary electrical systems, indicated on the Contract Drawings by symbols, schedules, diagrams, notes and described in these Specifications or reasonably implied therefrom to include the items in the following general outline of work to be performed:

1. Complete electric power distribution system as shown on the Contract Drawings, including conduit, cable, wire, accessories and necessary incidentals.
2. Connections to control equipment and other electrical equipment or electrically operated apparatus as detailed in other Sections of these Specifications and as shown on the Contract Drawings.
3. All conduits, junction boxes, fittings and accessories as necessary for the emergency call for assistance and connection to Instrumentation and Controls.

B. General Requirements: All work shall be done so as to conform to the latest edition of the Massachusetts State Building and the National Electrical Code.

C. The Contractor shall secure and pay for all permits and inspections required by local and state regulations.

D. It is intended to have all electrical work exposed, as shown on the Contract Drawings, or as directed by the Engineer at the time of installation.

E. The right is reserved by the Owner or Owner's Representative, to make reasonable changes in locations of equipment, outlets, or wiring prior to the installation without involving additional cost or expense to the Owner.

F. The Contractor shall visit the site of the work and familiarize himself with all available information concerning the nature of the structural, mechanical, and electrical conditions bearing on installation, transportation, handling and storage of necessary materials and equipment. Failure of the Contractor to acquaint himself with all available information concerning the above conditions will not relieve him from responsibility for estimating the difficulties and costs of successfully performing the complete work under this Contract.

1.02 ELECTRICAL WORK

A. The Contractor shall be responsible for disconnecting and reconnecting motors for pumps as indicated.

B. The contractor shall repair the pump enable/disable switches as indicated.

ELECTRIC WORK 16000-1

- C Contractor shall provide and adjust the motor starter overload settings to match and protect the revised pump motors horse power.
- D The Contractor shall schedule and coordinate the installation of the electric with the owner and project engineer.

1.03 CALL FOR ASSISTANCE SYSTEM

- A Contractor shall furnish and install all conduit, junction boxes, gang boxes, fittings and accessories required for the call for aid system as indicated.

1.04 SUBMITTALS

- A Comply with pertinent provisions of Section 01300, Submittals.
- B Shop Drawings shall give all construction details, dimensions, operating characteristics, load ratings, electrical ratings, etc., for the equipment and materials included under this Section.
- C Operation and Maintenance Manuals: The Contractor shall furnish Instructions, Operation and Maintenance Manuals for the electrical equipment as specified in Division 1

1.05 PRODUCT HANDLING

- A Comply with pertinent provisions of Product Handling in Division 1

1.06 EQUIPMENT LOCATIONS

- A All Drawings showing layout of electrical systems are diagrammatic only and are not intended to show exact routing of conduits, outlets, equipment, or wiring. Exact and final locations shall be determined in the field and shall be subject to approval by the Engineer.
- B Exposed conduits shall be run straight and parallel to structural lines wherever possible and shall be securely fastened with proper standoffs and supports to the surfaces over which they are installed. The right to make any reasonable change in location of conduit, outlets, equipment or wiring up to the time of actual construction or installation is reserved by the Owner or Engineer without involving any additional expense to the Owner.
- C All electrical equipment requiring periodic inspection, operation, or maintenance shall be so located as to be readily accessible. Contractor shall submit conduit layout plans for approval before starting installation.
- D If during construction the fact is disclosed that such equipment as shown on the Contract Drawings is not so located, then the Contractor shall call the Engineer's attention to such conditions before advancing his work to a stage where change would cause additional cost or expense.

1.07 CONDUIT LOCATIONS

- A The Contractor's attention is directed to the fact that all conduit runs indicated on the Contract Drawings are indicated diagrammatically for the purpose of outlining the general method of routing the conduits to avoid interference with other work. Should any structural difficulties prevent the setting of cabinets, boxes, conduits, and other equipment at the points indicated on the Contract Drawings, deviations therefrom, as approved, will be permitted and shall be made without additional charge.

ELECTRIC WORK 16000-2

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Rigid Steel Conduit: Galvanized rigid steel conduit shall be as manufactured by Allied Tube & Conduit Corp. or approved equal.
- B. Conduit Fittings: Fittings shall be as manufactured by Hubble or approved equal.
- C. Outlet and Junction Boxes: Boxes shall be rugged die-cast aluminum construction as manufactured by Hubble/Bell weatherproof with threaded internal hubs or approved equal. Box covers shall be gasketed.

2.02 GENERAL

- A. The Contractor shall furnish and install all electrical apparatus, equipment, and labor, unless an exception is made by the Owner. All conduit and wiring, including fittings, boxes, covers, mounting hardware and accessories, for electrical equipment and electrically operated apparatus provided and/or installed under this Contract shall be furnished and installed by the Contractor, and he shall be responsible for all wiring connections to this equipment.

Panels and starters shall be provided, complete with "as-built" schematic and wiring diagrams. All wires shall be numbered, as shall each terminal strip for all of the associated equipment within panels. All motor starters, circuit breakers, relays, timers and all other components shall be labeled. All wiring to remote associated equipment shall be clearly described on the diagrams with remote equipment manufacturer, terminal numbers, and locations. The Contractor shall furnish and install engraved Lamacoid nameplates for all devices.

All materials shall conform to the requirements of the National Board of Fire Underwriters and shall bear applicable Underwriter's Laboratories labels. All electrical equipment shall conform to the requirements of the National Electrical Manufacturer's Association.

2.03 CONDUIT

- A. All conduits within the pumping station shall be galvanized rigid steel. The minimum size of conduit for both power and control wiring shall be 3/4 inch unless otherwise stated or indicated on the Contract Drawings.
- B. EMT/PVC conduit shall not be permitted.
- C. Flexible conduit shall be as specified liquid tight metallic with maximum length of 5 feet.

2.04 WIRES, CABLES AND TERMINATIONS

- A. In general, wires and cables shall have copper conductors with 600-volt insulation, Type THHN/THWN, or approved equal. Minimum wire size for power circuits shall be #12 AWG. Minimum wire size for starter and control circuits shall be #14 AWG, unless otherwise noted on the Contract Drawings. Wire and cable including all control wiring shall have stranded copper conductors.

ELECTRIC WORK
16000-3

Solid copper conductors shall not be used. Aluminum conductors will not be accepted and shall not be used.

B. No splices shall be made in any wire and cable, except at splice boxes, outlet boxes, and cabinets. Control wiring shall not be spliced.

C. Wiring installed in the electrical enclosures shall be concealed in conduits or raceways.

D. Wiring terminations and splices in cabinets, panels, outlet boxes or equipment shall have sufficient length to make up circuit connections, for extending circuits, or connecting to wiring devices or wire terminations. Minimum wire length shall be 6 inches.

G. The number of wires shown on the Contract Drawings in each conduit is approximate and may vary depending on equipment requirements. Additional wires shall be furnished and installed as required for satisfactory operation of equipment at no additional cost to the Owner.

2.05 WIRE IDENTIFICATION

A. Wire numbering shall conform to owners numbering convention.

B. Wire tags shall be installed at each terminated end of every conductor, including neutral and ground conductors, with both ends labeled identically. Circuits passing through junction boxes shall be Ty-wrapped into individual groups. Power circuits shall be labeled with the panelboard number and branch circuit number.

C. Color coding of multi-conductor control cables shall be as specified in NEMA Standard WC5.

D. Wires shall be labeled at each termination point. The labels shall be of a machine-printed type, black with white background, covered by a clear protective layer.

2.06 ELECTRICAL EQUIPMENT

A. Branch circuit breakers shall be compatible and labeled and listed for the panel they are installed in.

2.07 CALL FOR ASSISTANCE EQUIPMENT

A. Call for Assistance Equipment Shall be Edwards-Signaling or equal. Provide 12"x12"x6"NEMA 1 terminal box with hinged cover for interconnection of all signals. Label all wiring and terminals.

PART 3 – EXECUTION

3.01 CONDUIT INSTALLATION

A. Conduits shall be installed complete with all accessories, fittings, and boxes in an approved and workmanlike manner, so as to provide proper raceways for electrical conductors. Boxes, cabinets, panelboards, or other raceways with concentric and/or eccentric knockouts will not be allowed. Field punched knockouts shall be accepted. Penetration of the top of control boxes shall not be allowed. The use of reducing washers, Ericsons, compression fittings, set screw fittings, or running thread nipples will not be allowed. Myers hubs shall be used on conduits entering boxes unless box has internal hubs.

ELECTRIC WORK 16000-4

B. Exposed conduits shall be installed parallel or to right angles to the walls and ceiling with approved conduit bends or pull boxes where conduits change direction. Exposed conduits shall be held securely in place by approved means. All hangers and other steel parts shall be galvanized. All exposed conduits used in a single run or circuit shall be of the same type and finish.

C. All bends shall be carefully made to prevent distortion of the circular cross-section. Field made bends in conduits shall have an inside radius of not less than nine diameters. Where bends of less than nine diameters are necessary and are approved, standard factory elbows shall be used; however, the conduit size chosen shall permit a cable-bending radius within the factory elbow of at least eight times the cable diameter. No conduit shall have more than three 90° bends or the equivalent thereof between pulling points.

D. All steel and metallic conduits where cut shall be reamed carefully to remove burrs. No running thread will be permitted. All threaded ends of conduits shall be coated with an approved joint compound before connections are made. All screwed joints shall be watertight.

E. All conduits shall be bushed at the ends, except when using insulated hubs, Myers hubs or FS type boxes. Bushings shall be installed prior to pulling conductors.

E. All conduits shall be cleaned carefully before and after installation. Inside surfaces of completed conduits shall be free from all imperfections likely to injure the cable.

F. Fittings shall be installed to match the raceway being used. Fittings shall not be used to replace conduit bends and pull boxes, unless space or other problems make the use of fittings necessary. Oversize fittings shall be used whenever large cable is installed in order to maintain the proper bending radius.

G. The final conduit connection to motors, motorized equipment, or vibrating apparatus shall be made by the use of flexible, liquid-tight, conduit with liquid-tight fittings. Flexible conduit shall not be used for any outside service equipment.

H. All conduits shall be grouped neatly together as directed by the Engineer and in no case shall openings or working areas be blocked by conduits.

I. All conduits, regardless of their type shall have an Equipment Grounding Conductor (BOND) sized per the latest issue of the NEC. This includes Liquid-tight metallic conduit and conduits used for control and instrumentation.

J. All metallic conduit shall have bond bushing with separate bond to chassis or enclosure it enters except for internal thread hubs..

3.02 WIRING INSTALLATION

A. All cables and wires exterior to the apparatus to which they are connected shall be installed in conduit for their entire length. All wiring shall be installed in accordance with the applicable provisions of the National Electrical Code and as indicated on the Contract Drawings. Conductors shall be continuous from outlet to outlet. No splices shall be made except within outlet or junction boxes. All conductors to be contained within a single conduit shall be drawn in at the same time. Powdered soapstone or other approved compound shall be used as a lubricant in drawing conductors through conduits. A reasonable amount of slack shall be left in each conductor at panelboards, outlet boxes, and

ELECTRIC WORK 16000-5

other devices to facilitate the making of joints and connections to fixtures and equipment. No cable bend shall have a bending radius of less than eight times its diameter.

B. In the event that incorrect motor rotation requires reversal of two-phase conductors, that wiring change shall be made at the motor feeder circuit breaker.

C. Separate conduits shall be provided to isolate power, 120 volt control, 24 volt control, communications bus, and category 5. All low voltage (24 vdc only) circuits can share the same conduit.

3.03 GROUNDING AND BONDING

A. Equipment Grounding: All electrical equipment shall be suitably grounded as required by the National Electrical Code. Grounding of large items of equipment is generally indicated on the Contract Drawings. Provide supplementary insulated equipment grounding conductors for all loads; do not rely on the conduit or raceway as the sole ground. Provide conduit grounding bushings for all large feeders.

B. Grounding Conductors: All power circuits installed in nonmetallic conduit shall have included therewith an insulated or bare copper ground conductor. The conductor shall be uninsulated where installed in underground conduits. Ground conductor capacity shall be based on the feeder or branch circuit capability and shall be not less than the conductor-ground ratio shown in Table 250.122 of the National Electric Code, latest revision.

C. All control wiring conduits shall have an insulated ground conductor included.

3.04 INSPECTION AND TESTS

A. The entire electrical system shall be given a complete operational test after installation is completed by the Contractor in the presence of owner's representative and the Engineer.

3.05 START-UP SERVICES

A. The Contractor shall perform an operational test of the equipment furnished and/or installed under this Contract in the presence of the Engineer. Factory-trained service engineers representing the major equipment manufacturers shall be present to perform pre-start-up and start-up checks; calibrate, adjust or make alterations as required during start-up; retest after making adjustments to verify alterations and adjustments; and instruct town personnel on proper operating and maintenance procedures. Representative of the relevant subcontractors shall also be present to assist in making any adjustments.



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