

SALEM, MASSACHUSETTS



CONTRACT AND SPECIFICATIONS FOR

**Washington Street and Dodge Street
Utility Replacement Project**

BID # R-11

MAYOR

Kimberley Driscoll
City Hall
93 Washington Street
Salem, MA

CITY ENGINEER

David H. Knowlton, P.E.
City Hall Annex
120 Washington Street
Salem, MA

August 2015



TABLE OF CONTENTS

DIVISION 0 – GENERAL REQUIREMENTS

<u>Section</u>	<u>Title</u>
00020	Invitation to Bid
00100	Instructions to Bidders
00300	Forms for General Bid
00310	Bid Bond
00312	Statement of Bidder's Qualifications
00450	Certificate as to Corporate Bidder
00451	Certificate of Tax Compliance
00500	Agreement
00540	Notice of Award
00560	Notice to Proceed
00610	Performance Bond
00620	Payment Bond
00630	Certificate of Substantial Completion
00635	Change Order
00700	General Conditions
00800	Supplemental General Conditions
	Attachment I Massachusetts Prevailing Wage Rates

DIVISION 1 – GENERAL REQUIREMENTS

<u>Section</u>	<u>Title</u>
01010	Summary of Work
01025	Measurement and Payment
01040	Project Coordination
01045	Cutting, Coring, and Patching
01050	Field Engineering
01060	Permits and Regulatory Requirements
01063	Miscellaneous Requirements
01069	Massachusetts General Laws
01080	Abbreviations and Definitions
01090	Reference Standards
01105	Rodent Control
01108	Health and Safety Procedures
01110	Environmental Protection Procedures
01200	Project Meetings
01210	General Requirements for Utility Work
01300	Submittal Procedures
01310	Construction Progress Schedules
01346	As-Built Drawings
01370	Schedule of Values
01400	Quality Assurance

01500	Temporary Facilities and Controls
01505	Mobilization
01551	Portable Changeable Message Sign
01560	Temporary Environmental Controls
01568	Erosion Control, Sedimentation and Containment of Construction Materials
01600	Control of Materials
01610	Delivery, Storage, and Handling
01700	Contract Closeout
01710	Cleaning Up
01740	Warranties and Bonds
01850	Traffic Management

DIVISION 2 – SITEWORK

<u>Section</u>	<u>Title</u>
02010	Subsurface Investigation
02050	Demolition, Alteration, and Abandonment
02080	Soil and Waste Management
02095	Transportation and Disposal of Soil and Fill
02100	Site Preparation
02210	Earth Excavation, Backfill, Fill and Grading
02252	Precast Concrete Manholes
02271	Riprap
02273	Geotextile Fabric
02480	Landscaping
02498	Restoration of Disturbed Areas
02500	Paving and Surfacing
02524	Curbs, Walks, and Driveways
02577	Pavement Markings
02590	Brick and Concrete Block Masonry
02604	Catch Basins
02610	Pipe Testing and Cleaning
02615	Ductile Iron Pipe and Fittings
02620	High Density Polyethylene Pipe
02622	Polyvinyl Chloride Gravity Pipe
02623	Polypropylene Pipe
02640	Valves and Appurtenances
02645	Hydrants
02647	Connecting to Existing Water Mains
02652	External Chemical Sealing for Manholes
02660	Water Services
02675	Disinfection of Water Mains
02704	Pipeline Pressure and Leakage Testing
02761	Bypass Flow Handling
02763	Interior Manhole Rehabilitation
02765	Sewer Line and Manhole Cleaning

DIVISION 3 – CONCRETE

<u>Section</u>	<u>Title</u>
03300	Cast-in-Place Concrete
03315	Grout
03730	Concrete Rehabilitation

DIVISION 5 – METALS

<u>Section</u>	<u>Title</u>
05501	Anchor Bolts

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

<u>Section</u>	<u>Title</u>
07160	Bituminous Dampproofing

DIVISION 16- ELECTRICAL

<u>Section</u>	<u>Title</u>
16010	Electrical Work- General Provisions
16110	Raceways
16120	Wires and Cables

ATTACHMENTS

1. Flow Assessment Services: Salem, MA Manhole Inspection Report (March 2015)
2. Flow Assessment Services: Salem, MA Flow Monitoring Data (March 2015)
3. Sluice Gate Chamber Inspection Photos 3/11/2015
4. South River Conduit CCTV Inspection Photos
5. CCTV Inspection Logs
6. ADS Pipe and Fitting Details
7. NGrid Email Correspondence

SECTION 00020

INVITATION TO BID # R-11

WASHINGTON STREET AND DODGE STREET
UTILITY REPLACEMENT PROJECT

Sealed Bids for the WASHINGTON ST. & DODGE ST. UTILITY REPLACEMENT PROJECT will be received by the City of Salem (the OWNER), by the City of Salem Purchasing Office, 93 Washington Street 2nd Floor, Salem, MA 01970 until 11:00 A.M. local time on August 27, 2015 at which time the Bids will be publicly opened and read aloud. Bids shall be addressed to the City of Salem Purchasing Office, 93 Washington Street 2nd Floor Salem, MA 01970 and shall be labeled "WASHINGTON STREET and DODGE STREET UTILITIES".

An informational "pre-bid" meeting will be held at 9:00 A.M. local time on August 12, 2015 in the third floor conference room in the City Hall Annex, 120 Washington Street, Salem, MA 01970. All prospective bidders are strongly encouraged to attend the "pre-bid" meeting.

The work involves installation of new 42-inch diameter sewer pipe, connecting to existing sewer structures in conjunction with bypass pumping, modification and abandonment of existing sewer structures, installation of new water and drain pipes and structures, abandonment of existing water and drain pipes and structures, installation of new electric conduits and manhole, assisting NGrid with installation of new high and low pressure gas pipes, traffic management and coordination, and pavement and sidewalk removal and reconstruction.

The estimated cost for this project is \$2,000,000.00.

Bid security in the form of a bid bond, cash, certified checks, treasurer's or cashier's check, payable to the OWNER, is required in the amount of five percent (5%) of the total bid, in accordance with the conditions in Section 00100 – INSTRUCTIONS TO BIDDERS.

Successful bidder must furnish 100 percent Construction Performance Bond and 100 percent Construction Payment Bond from a surety company acceptable to the Owner.

Every bid bond, every performance bond and every payment bond issued for any construction work in the Commonwealth shall be the bond of a surety company organized pursuant to Section 105 of Chapter 175 or of a surety company authorized to do business in the Commonwealth under the provisions of Section 106 of said Chapter 175 and be approved by the U. S. Department of Treasury and acceptable as sureties and reinsurers on federal bonds under Title 31 of the United States Code, sections 9304 to 9308.

Contract Documents may be examined and obtained at the Purchasing Office located at 93 Washington Street 2nd Floor, Salem, MA 01970, Phone: (978) 619-5695. City Hall hours are Monday through Wednesday 8:00 A.M. to 4:00 P.M., Thursday 8:00 A.M. to 7:00 P.M., and Friday 8:00 A.M. to 12:00 P.M. To obtain a copy of the Contract Documents, starting August 5, 2015 after 9:00 A.M., a \$100 refundable deposit is required. Checks shall be payable to the City of Salem. Cash will not be accepted. Drawings and other Contract Documents will be mailed, if requested, upon receipt of a street (not a P.O. Box) address and an additional check in the amount of \$25.00, payable to the City of Salem as nonrefundable postage and handling fee. Do not combine amounts into one check. Document deposits

will be refunded upon return of the documents in good condition within fifteen (15) days after the opening of general bids. Drawings and Specifications must be returned to the office of the Purchasing Agent for refunds of deposits; no Drawings and Specifications will be accepted at the bid openings.

A copy of the Contract Documents is also available for examination at the City of Salem website (http://www.salem.com/Pages/SalemMA_Purchasing/index) and the Massachusetts COMMBUYS website (<https://www.commbuys.com/bsa/>).

Contract time (to substantial completion of the project) is Two Hundred Seventy (270) calendar days commencing from the date of the Notice to Proceed. Contract time to final completion shall be Three Hundred (300) calendar days, but no later than August 1, 2016.

No Bidder may withdraw his/her Bid for a period of Sixty (60) days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids.

Complete instructions for filing Bids are included in the Instruction to Bidders.

Minimum Wage Rates as determined by the Commissioner of Department of Labor and Industries under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27D, as amended, apply to this project. It is the responsibility of the Contractor, before bid opening, to request if necessary any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed work under this contract.

Prevailing Wage Rates as determined by the Commissioner under the provisions of the Massachusetts General Laws, Chapter 149, sections 26 to 27H, apply to this project.

Pursuant to the applicable provisions of Chapter 149 and Chapter 30, 39M of the General Laws and over \$10,000, contracts resulting from bids issued on or after July 1, 2006, the Contractor agrees and hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

The bidding and award of the Contract shall be in full compliance with Sections 39M inclusive of Chapter 30 of the General Laws of the Commonwealth of Massachusetts as last revised.

The OWNER reserves the right to reject any or all bids and to determine which bid is, in the OWNER'S judgment, the lowest responsive bid of a bidder or group of bidders. The OWNER also reserves the right to waive any informality in any bid and to delete certain items listed in the bid as set forth therein.

City of Salem, Massachusetts

David H. Knowlton, P.E.
City Engineer

END OF SECTION 00020

SECTION 00100

INSTRUCTIONS TO BIDDERS

- Article 1. Receipt and Opening of Bids
- Article 2. Deposit on Drawings and Documents
- Article 3. Ability and Experience of Bidder
- Article 4. Information Not Guaranteed
- Article 5. Subsurface Investigation
- Article 6. Easements
- Article 7. Other Contracts
- Article 8. Bidders to Investigate
- Article 9. Questions Regarding Drawings and Documents
- Article 10. Blank Form for Bid
- Article 11. Alternates
- Article 12. Bid Security
- Article 13. Withdrawal of Bids
- Article 14. Right to Reject Bids
- Article 15. Comparison of Bids
- Article 16. Reduction in Scope of Work
- Article 17. Contract Bonds
- Article 18. Execution of Agreement
- Article 19. Insurance Certificates
- Article 20. Massachusetts Sales and Use Tax
- Article 21. Massachusetts Wage Rates
- Article 30. Utility Underground Plant Damage Prevention System
- Article 31. Competitive Bidding

ARTICLE 1. RECEIPT AND OPENING OF BIDS

- 1.1 Sealed Bids for the work of this Contract will be received at the time and place indicated in the Invitation to Bid.
- 1.2 OWNER may consider informal any Bid not prepared and submitted in accordance with the provisions hereof.
- 1.3 Bidders are cautioned that it is the responsibility of each individual bidder to assure that his bid is in the possession of the responsible official or his designated alternate prior to the stated time and at the place of the Bid Opening. Owner is not responsible for bids delayed by mail and/or delivery services, of any nature.
- 1.4 If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope and addressed to Whitney Haskell, Purchasing Agent, City of Salem Purchasing Office, 93 Washington Street 2nd Floor, MA 01970.

ARTICLE 2. DEPOSIT ON DRAWINGS AND DOCUMENTS

- 2.1 Upon award of the Contract, the Contractor will be provided with one (1) full size set of reproducibles from which he can make, at his own expense, prints necessary for execution of the Work.

ARTICLE 3. ABILITY AND EXPERIENCE OF BIDDER

- 3.1 No award will be made to any bidder who cannot satisfy the Owner that he has sufficient ability and experience in this class of work and sufficient capital and plant to enable him to prosecute and complete the Work successfully within the time named. The Owner's decision or judgment on these matters shall be final, conclusive, and binding.
- 3.2 The Owner may make such investigations as it deems necessary, and the Bidder shall furnish to the Owner, under oath if so required, all such information and data for this purpose as the Owner may request.

ARTICLE 4. INFORMATION NOT GUARANTEED

- 4.1 All information given on the Drawings or in the other Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of bidders and is not guaranteed.
- 4.2 It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes or other structures encountered during construction will be the same as those indicated on the Drawings or in the other Contract Documents.
- 4.3 It is agreed further and understood that no bidder nor Contractor shall use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner

or the Engineer, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

ARTICLE 5. SUBSURFACE INVESTIGATION

- 5.1 Limited subsurface investigations have been completed by the Engineer or Owner as part of the design of this project and by Others during previous projects. Copies of the boring logs and a map identifying approximate locations are attached to these Contract Documents for reference. The Contractor shall conduct subsurface investigations and exploratory excavations at the locations indicated on the drawings, and at all locations of known or suspected utility crossings prior to beginning installation and layout of proposed utilities.
- 5.2 The Contractor shall be aware that borings have been provided in some locations, but the existing soil conditions and groundwater levels in other areas are not known. Contractor shall assume that construction dewatering due to high seasonal and tidally influenced groundwater and removal and disposal of unsuitable soils will be required during construction.

ARTICLE 6. EASEMENTS

- 6.1 On all lands, the Contractor has no rights unless he obtains them from the proper parties.
- 6.2 The Contractor shall not work on property requiring an easement until the Owner has obtained the necessary easement.
- 6.3 The Contractor shall have no claim for additional compensation or damage on account of any delay in obtaining the necessary easements.

ARTICLE 7. OTHER CONTRACTS

- 7.1 It is essential that all parties interested in the project cooperate to the end that the entire project will be brought to a successful conclusion as rapidly as possible, but the Owner cannot guarantee that no interference or delay will be caused thereby. Interference and delay resulting from such cooperation shall not be the basis of claims against the Owner.

ARTICLE 8. BIDDERS TO INVESTIGATE

- 8.1 Bidders must satisfy themselves by personal examination of the site of the Work and by such other means as they may wish, as to the actual conditions there existing, the character and requirements of the Work, the difficulties attendant upon its execution, and the accuracy of all estimated quantities stated in the Bid.

ARTICLE 9. QUESTIONS REGARDING DRAWINGS AND DOCUMENTS

- 9.1 In general, no answer will be given to prospective bidders in reply to an oral question if the question involves an interpretation of the intent or meaning of the Drawings or other Contract Documents, or the equality or use of products or methods other than those designated or described on the Drawings or in the Specifications. Any information given to bidders other than by means of the Drawings and other Contract Documents, including Addenda, as described below, is given informally, for information and the convenience of the bidder only and is not guaranteed. The bidder agrees that such information shall not be used as the basis of nor shall the giving of any such information entitle the bidder to assert any claim or demand against the Owner or the Engineer on account thereof.
- 9.2 To receive consideration, such questions shall be submitted in writing to Whitney Haskell, Purchasing Agent, City of Salem Purchasing Office, 93 Washington Street 2nd Floor, Salem, MA 01970 at least seven days before the established date for receipt of Bids. The Engineer will neither approve nor disapprove particular products prior to the opening of Bids; such products will be considered when offered by the Contractor for incorporation into the Work, in accordance with the requirements of Section 01300 - SUBMITTAL PROCEDURES.
- 9.3 The Owner will set forth as Addenda, which shall become a part of the Contract Documents, such questions received as above provided as in his sole judgment are appropriate or necessary and his decision regarding each. At least five days prior to the receipt of Bids, he will send a copy of these Addenda to those prospective bidders and parties known to have taken out sets of the Drawings and Contract Documents.
- 9.4 The Contractor agrees to use and base his/her bid on the products and methods designated or described in the Specifications as amended by the Addenda.

ARTICLE 10. BLANK FORM FOR BID

- 10.1 All bids must be upon the blank form for Bid annexed hereto, state the proposed price of each item of the Work, both in words and in figures, and be signed by the bidder with his business address and place of residence.

ARTICLE 11. ALTERNATES

- 11.1 Alternate Bids are identified in Forms for General Bid - Section 00300.

ARTICLE 12. BID SECURITY

- 12.1 Each bid must be accompanied by a bid deposit in the form of a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company and payable to the order of the City of Salem or by a bid bond prepared on the form of BID BOND (see Section 00410) attached hereto duly executed and acknowledged by the bidder, as Principal, and by a surety company qualified to do business in the Commonwealth of Massachusetts and satisfactory to the Owner, as Surety. The bid deposit shall be in the sum of 5 percent of the value of the Bid and shall be enclosed in the sealed envelope containing the Bid.

- 12.2 Every bid bond, every performance bond and every payment bond issued for any construction work in the Commonwealth shall be the bond of a surety company organized pursuant to Section 105 of Chapter 175 or of a surety company authorized to do business in the Commonwealth under the provisions of Section 106 of said Chapter 175 and be approved by the U. S. Department of Treasury and acceptable as sureties and reinsurers on federal bonds under Title 31 of the United States Code, sections 9304 to 9308.
- 12.3 Each such check or bid bond amount may be held by the Owner as security for the fulfillment of the bidder's agreements as hereinabove set forth and as set forth in the BID. Should the bidder fail to fulfill such agreements the bid check shall become the property of the Owner or if a bid bond was furnished the bid bond shall become payable to the Owner, as liquidated damages; otherwise, the bid check shall be returned to the bidder as hereinafter provided, or if the security is a bid bond, the bid bond shall become null and void.
- 12.4 Bid securities will be returned to all except the three lowest bidders within five days, Sundays and legal holidays excluded, after the opening of Bids, and to the three lowest bidders within five days, Sundays and legal holidays excluded, after the Owner and the accepted bidder have executed the AGREEMENT. In the event that the AGREEMENT has not been executed by both the accepted bidder and the Owner within twenty-one consecutive days after the opening of Bids, the bid security will be returned promptly to any bidder who has not been notified of the acceptance of his Bid.
- 12.5 Bid checks accompanying Bids which are rejected will be returned within five days, Sundays and legal holidays excluded, after rejection.
- 12.6 None of the three lowest Bids shall be deemed rejected, notwithstanding acceptance of any BID, until the AGREEMENT has been executed by both the Owner and the accepted bidder.

ARTICLE 13. WITHDRAWAL OF BIDS

- 13.1 Except as hereinafter in this subsection otherwise expressly provided, once his Bid is submitted and received by the Owner for consideration and comparison with other bids similarly submitted, the bidder agrees that he may not and will not withdraw it within Sixty (60) days excluding Saturdays, Sundays and legal holidays after the actual date of the opening of Bids.
- 13.2 Upon proper written request and identification, Bids may be withdrawn only as follows:
1. At any time prior to the designated time for the opening of Bids.
 2. Provided the Bid has not theretofore been accepted by the Owner, at any time subsequent to the expiration of the period during which the bidder has agreed not to withdraw his Bid.

- 13.3 Unless a Bid is withdrawn as provided above, the bidder agrees that it shall be deemed open for acceptance until the AGREEMENT has been executed by both parties thereto or until the Owner notifies a bidder in writing that his Bid is rejected or that the Owner does not intend to accept it, or returns his Bid deposit. Notice of acceptance of a Bid shall not constitute rejection of any other Bid.

ARTICLE 14. RIGHT TO REJECT BIDS

- 14.1 The Owner reserves the right to reject any or all Bids if the Bid cost exceeds available funds approved by the City of Salem.
- 14.2 The Owner reserves the right to reject any or all Bids, should the Owner deem it to be in the public interest to do so.
- 14.3 The Owner may reject Bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities, or the Owner may waive such omissions, conditions or irregularities.

ARTICLE 15. COMPARISON OF BIDS

- 15.1 Bids will be compared on the basis of the quantities and unit and lump-sum prices stated in the BID.
- 15.2 In the event that there is a discrepancy in the Bid between the lump sum or unit prices written in words and figures, the prices written in words shall govern.
- 15.3 The Owner agrees to examine and consider each Bid submitted in consideration of the Bidder's agreements, as hereinabove set forth and as set forth in the BID.

ARTICLE 16. REDUCTION IN SCOPE OF WORK

- 16.1 The Owner reserves the right to decrease the scope of the work to be done under this Contract and to omit any work in order to bring the cost within available funds. To this end, the Owner reserves the right to reduce the quantity of any items or omit all of any items as set forth in the BID, either prior to executing the Contract or at any time during the progress of the work. The Owner further reserves the right, at any time during the progress of the work, to restore all or part of any items previously omitted or reduced. Exercise by the Owner of the above rights shall not constitute any ground or basis of claim for damages or for anticipated profits on the work omitted.
- 16.2 The work that may be reduced or deleted specifically includes, but is limited to:
- Item No. 41 Furnish and Install 20-inch Linestops
 - Item No. 42, Furnish and Install 12-inch Linestops or Insertion Valves
 - Item No. 43, Furnish and Install (6-8)-inch Linestops or Insertion valves

Item No. 61, Assist NGrid with PE Gas Pipe Installation – Excavation, Coordination, Backfill

Item No. 62, Install New NGrid Electric Manhole, Materials by Others

Item No. 63, Install New NGrid Electric Conduit Duct Bank, Materials by Others

ARTICLE 17. CONTRACT BONDS

- 17.1 The Bidder whose Bid is accepted agrees to furnish the Contract Bonds in the forms which follow in Section 00610 – PERFORMANCE BOND and Section 00620 – PAYMENT BOND, each in the sum of the full amount of the Contract and duly executed by the said bidder as Principal and by a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Owner, as Surety, for the faithful performance of the Contract and payment for labor and materials. The premiums for such Bonds shall be paid by the Contractor.
- 17.2 Every bid bond, every performance bond and every payment bond issued for any construction work in the Commonwealth shall be the bond of a surety company organized pursuant to Section 105 of Chapter 175 or of a surety company authorized to do business in the Commonwealth under the provisions of Section 106 of said Chapter 175 and be approved by the U. S. Department of Treasury and acceptable as sureties and reinsurers on federal bonds under Title 31 of the United States Code, sections 9304 to 9308.

ARTICLE 18. EXECUTION OF AGREEMENT

- 18.1 The Bidder whose Bid is accepted will be required and agrees to duly execute the AGREEMENT and furnish the required CONTRACT BONDS within the time limit stated in the BID after notification that the AGREEMENT is ready for signature.
- 18.2 The Bidder to whom the Contract is awarded shall comply with the provisions of Chapter 30, Section 39R of the General Laws of Massachusetts as amended to date; and as provided therein shall, prior to execution of the contract, file a statement of management on internal accounting controls and an audited financial statement for the most recent completed fiscal year. See Specification Attachments – MASSACHUSETTS GENERAL LAWS.

ARTICLE 19. INSURANCE CERTIFICATES

- 19.1 The Contractor will not be permitted to start any construction work until he has submitted certificates covering all insurances called for under Article 2.05 of Section 00800 – SUPPLEMENTARY CONDITIONS.

ARTICLE 20. MASSACHUSETTS SALES AND USE TAX

- 20.1 Materials and equipment purchased for permanent installation in this project will be exempt from the Massachusetts Sales and Use Tax. The exemption certificate number

will be furnished to the Contractor. Each bidder shall take this exemption into account in calculating his bid for the work.

ARTICLE 21. MASSACHUSETTS WAGE RATES

- 21.1 Massachusetts Wage Rates as established pursuant to the provisions of M.G.L. Chapter 149 Section 26-27G apply to this project. The Massachusetts Wage Determination is attached to these specifications. It is the responsibility of the Contractor, before bid opening, to request, if necessary, any additional information on Massachusetts Wage Rates for those trades people who are not covered by the applicable Massachusetts Wage Decision, but who may be employed for the proposed work under this contract.

ARTICLE 30. UTILITY UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

- 30.1 All excavations within public or private ways are subject to the requirements of Massachusetts General Law, Chapter 82, Section 40 included in Part II of the Supplementary Conditions.

ARTICLE 31. COMPETITIVE BIDDING

- 31.1 The bidding and award of the Contract shall be in full compliance with Section 39 M inclusive of Chapter 30 of the General Laws of the Commonwealth of Massachusetts as last revised.

END OF SECTION 00100

SECTION 00300

FORMS FOR GENERAL BID

To the City of Salem, herein called the Owner, acting by and through its Purchasing Agent, for the WASHINGTON STREET and DODGE STREET UTILITY REPLACEMENT PROJECT.

The Undersigned, as bidder, herein referred to as singular and masculine, declares as follows:

- (1) The only parties interested in this BID as Principals are named herein;
- (2) This BID is made without collusion with any other person, firm, or corporation;
- (3) No officer, agent, or employee of the Owner is directly or indirectly interested in this BID;
- (4) He has carefully examined the site of the proposed Work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed Work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this BID, and he has carefully read and examined the Drawings, the annexed proposed AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;
- (5) He understands that information relative to subsurface and other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) has been furnished only for his information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered will be the same as those shown on the Drawings or in any of the other Contract Documents and he agrees that he shall not use or be entitled to use any such information made available to him through the Contract Documents or otherwise or obtained by him in his own examination of the site, as a basis of or ground for any claim against the Owner or the Engineer arising from or by reason of any variance which may exist between the aforesaid information made available to or acquired by him and the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered during the construction work, and he has made due allowance therefore in this BID;
- (6) and he understands that the quantities of work tabulated in this BID or indicated on the Drawings or in the Specifications or other Contract Documents are only approximate and are subject to increase or decrease as deemed necessary by the Engineer; and he agrees that, if this BID is accepted he will contract with the Owner, as provided in the copy of the Contract Documents deposited in the office of the Engineer, this BID form being part of said Contract Documents, and that he will perform all the work and furnish all the materials and equipment, and provide all labor, services, plant, machinery, apparatus, appliances, tools, supplies and all other things required by the Contract Documents in the manner and within the time therein

prescribed and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefore the lump sum or unit price applicable to each item of the Work as stated in the schedule below.

- (7) and he understands that the Owner reserves the right to decrease the scope of the work to be done under this Contract and to delete any work in order to bring the cost within available funds or for any other reason in the best interest of the Owner. To this end, the Owner reserves the right to reduce the quantity of any items and/or delete entire items as set forth in the BID, either prior to executing the Contract or at any time during the progress of the work. The Owner further reserves the right, at any time during the progress of the work, to restore all or part of any items previously deleted or reduced. Exercise by the Owner of the above rights shall not constitute any ground or basis of claim for damages or for anticipated profits on the work reduced or deleted.

- (8) The work that may be reduced or deleted specifically includes, but is limited to:

Item No. 41 Furnish and Install 20-inch Linestops

Item No. 42, Furnish and Install 12-inch Linestops or Insertion Valves

Item No. 43, Furnish and Install (6-8)-inch Linestops or Insertion valves

Item No. 61, Assist NGrid with PE Gas Pipe Installation – Excavation, Coordination, Backfill

Item No. 62, Install New NGrid Electric Manhole, Materials by Others

Item No. 63, Install New NGrid Electric Conduit Duct Bank, Materials by Others

(Note: Bidders must bid on each item. All entries in the entire BID must be made clearly and in ink. In case of discrepancy between prices in writing and in figures; the writing shall govern. In case of discrepancy between the product obtained by multiplying the estimated quantity by the unit price, and the extended amount, the product obtained shall govern. In case of discrepancy between total of extended amounts and total amount of bid stated, total of items shall govern. Use the pages in this document when submitting proposal and submit contract documents intact).

Refer to Section 01025 - MEASUREMENT AND PAYMENT for Item Descriptions.

Base Bid:

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
1	LS	Mobilization/Demobilization (Not to Exceed 5% of Total Bid) ____ Dollars ____ Cents Per Lump Sum	1	 \$ _____	 \$ _____
2	LS	Traffic and Pedestrian Safety and Management ____ Dollars ____ Cents Per Lump Sum	1	 \$ _____	 \$ _____
3	DAYS	Variable Programmable Message Boards ____ Dollars ____ Cents Per Day	50	 \$ _____	 \$ _____
4	LS	Surveying ____ Dollars ____ Cents Per Lump Sum	1	 \$ _____	 \$ _____
5	LS	Demolition ____ Dollars ____ Cents Per Lump Sum	1	 \$ _____	 \$ _____
6	LF	Remove and Stack Granite Curb ____ Dollars ____ Cents Per Linear Foot	1,150	 \$ _____	 \$ _____

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
7	LS	Modify Sewer Sluice Gate Structure _____ Dollars _____ Cents Per Lump Sum	1	\$ _____	\$ _____
8	CY	Exploratory Excavation _____ Dollars _____ Cents Per Cubic Yard	750	\$ _____	\$ _____
9	CY	Rock Excavation (Minimum) _____ Sixty _____ Dollars _____ Zero _____ Cents Per Cubic Yard	500	\$ _____	\$ _____
10	CY	Additional Rock Excavation (Additional) _____ Dollars _____ Cents Per Cubic Yard	500	\$ _____	\$ _____
11	CY	Earth Excavation and Refill Below Normal Depth _____ Dollars _____ Cents Per Cubic Yard	250	\$ _____	\$ _____
12	CY	Loading, Hauling, and Disposal of Excess or Unsuitable Soil _____ Dollars _____ Cents Per Cubic Yard	2,000	\$ _____	\$ _____
13	ALLOW	Additional Cost for Soil Disposal Allowance	N/A	N/A	\$50,000.00

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
14	CY	Provide and Install Controlled Density Fill _____ Dollars _____ Cents Per Cubic Yard	250	\$ _____	\$ _____
15	SY	Support of Excavation, Left in Place _____ Dollars _____ Cents Per Square Yard	350	\$ _____	\$ _____
16	LS	Bypass Pumping _____ Dollars _____ Cents Per Lump Sum	1	\$ _____	\$ _____
17	LF	Furnish and Install 42-inch PP Sewer Pipe _____ Dollars _____ Cents Per Linear Foot	290	\$ _____	\$ _____
18	LF	Furnish and Install 36-inch PP Sewer Pipe _____ Dollars _____ Cents Per Linear Foot	20	\$ _____	\$ _____
19	LF	Furnish and Install 24-inch PP Sewer Pipe _____ Dollars _____ Cents Per Linear Foot	20	\$ _____	\$ _____
20	LF	Furnish and Install 12-inch PVC Sewer Pipe _____ N/A _____ Dollars _____ N/A _____ Cents Per Linear Foot	0	\$0.00	\$0.00

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
21	LF	Furnish and Install 8-inch PVC Sewer Pipe	50		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
22	LF	Furnish and Install 18-inch HDPE or DI Drain Pipe	290		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
23	LF	Furnish and Install 12-inch HDPE or DI Drain Pipe	150		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
24	VF	Furnish and Install New Catch Basins or Manholes	100		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Vertical Foot			
25	VF	Furnish and Install New 8-Foot Diameter Manholes	70		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Vertical Foot			
26	EA	Core Connect to Existing Pipe or Structures, less than 24-inches	2		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
27	EA	Core Connect to Existing Pipe or Structures, less than 24-inches or Greater _____ Dollars _____ Cents Per Each	10	\$_____	\$_____
28	EA	Remove and Dispose or Abandon Existing Structures _____ Dollars _____ Cents Per Each	10	\$_____	\$_____
29	VF	Reconstruct Sewer or Drain Structures _____ Dollars _____ Cents Per Vertical Foot	60	\$_____	\$_____
30	VF	Structure Rehabilitation - Clean, Grout, Waterproof _____ Dollars _____ Cents Per Vertical Foot	30	\$_____	\$_____
31	EA	Structure Rehabilitation - Replace Frame and Cover or Grate _____ Dollars _____ Cents Per Each	10	\$_____	\$_____
32	EA	Structure Rehabilitation - Build/Rebuild Invert and Bench _____ Dollars _____ Cents Per Each	2	\$_____	\$_____

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
33	EA	Furnish and Deliver New Manhole or Catch Basin Castings	25		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
34	EA	Furnish and Install Brick and Mortar Plugs, (8 to 18) - inch Diameter	6		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
35	EA	Furnish and Install Brick and Mortar Plugs, Greater than 18 - inch Diameter	8		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
36	LF	Furnish and Install 20-inch DI Water Pipe	60		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
37	LF	Furnish and Install 12-inch DI Water Pipe	450		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
38	LF	Furnish and Install (4 to 8)-inch DI Water Pipe	200		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
39	LF	Furnish and Install 1-inch Copper Service Pipe	75		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
40	EA	Furnish and Install City of Salem Water Meter Box	1		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
41	EA	Furnish and Install 20-inch Linestops	1		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
42	EA	Furnish and Install (10 to 12)-inch Linestops or Insertion Valves	2		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
43	EA	Furnish and Install (6 to 8)-inch Linestops or Insertion Valves	1		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
44	EA	Furnish and Install 20-inch Gate Valves	2		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
45	EA	Furnish and Install 12-inch Gate Valves	5		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
46	EA	Furnish and Install (4 to 8)-inch Gate Valves	6		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
47	EA	Furnish and Install New Fire Hydrants	2		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
48	EA	Remove and Stack Fire Hydrants	2		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
49	EA	Furnish and Install Restrained Caps or Plugs, All Sizes	10		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
50	EA	Remove Valve Boxes, Restore Area	8		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
51	LF	Install Temporary or Permanent City Conduits and Wires	250		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
52	SY	Stripping and Disposing Existing Pavement, Sidewalk, Curb, and Subbase	750		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Square Yard			
53	CY	Provide and Install Gravel Sub-base	250		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Cubic Yard			
54	LF	Furnish and Install Bituminous Curb/Berm	1,400		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			
55	SY	2-inch Temporary Bituminous Concrete Pavement	2,000		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Square Yard			
56	SY	4-inch Permanent Bituminous Concrete Pavement	3,000		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Square Yard			
57	SY	3-inch Permanent Hand Placed Bituminous Concrete Pavement	400		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Square Yard			

Item No.	Unit	Description	Estimated Quantity	Unit Price (In Figures)	Extended Total (In Figures)
58	SY	Install Cement Concrete Sidewalks	25		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Square Yard			
59	SY	Loam and Seed	750		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Square Yard			
60	LS	Restoration	1		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Lump Sum			

Total Amount of Base Bid (Items 1 through 60) inclusive:

\$ _____

(Amount in figures)

(Amount in words)

Alternate Bid No. 1:

61	LF	Assist NGrid with PE Gas Pipe Installation - Excavation, Coordination, Backfill	700		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			

Total Amount of Alternate Bid No. 1: (Item 61) inclusive:

\$ _____

(Amount in figures)

(Amount in words)**Alternate Bid No. 2:**

62	EA	Install New NGrid Electric Manhole Materials by Others	1		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Each			
63	LF	Install New NGrid Conduit Duct Bank, Materials by Others	1,000		
		_____ Dollars			
		_____ Cents		\$ _____	\$ _____
		Per Linear Foot			

Total Amount of Alternate Bid No. 2: (Items 62 through 63) inclusive:

\$ _____

(Amount in figures)

(Amount in words)

The basis of award will be based on the prices bid for Base Bid, or Base Bid plus Alternate Bid No. 1, or Base Bid plus Alternate Bid No. 2, or Base Bid plus Bid Alternate Bid Nos 1 and 2 at the sole discretion and best interest of the Owner.

TOTAL BASE BID (Items 1-60): \$ _____

**TOTAL BASE BID PLUS
ALTERNATE BID No. 1 (Items 1-61):** \$ _____

**TOTAL BASE BID PLUS
ALTERNATE BID No. 2 (Items 1-60, 62, 63):** \$ _____

**TOTAL BASE BID PLUS
ALTERNATE BID Nos. 1 and 2 (Items 1-63):** \$ _____

The undersigned agrees that for extra work, if any, will be performed in accordance with Article 10 of the General Conditions of the Contract and will be paid for in accordance with Article 11 of the General Conditions of the Contract.

The bid security accompanying this BID shall be in the amount of 5 percent of the BID.

The undersigned must furnish 100 percent Construction Performance Bond and 100 percent Construction Payment Bond with a surety company acceptable to the Owner.

The bidding and award of the contract will be in full compliance with Section 39M inclusive of Chapter 30 of the General Laws of the Commonwealth of Massachusetts as last revised.

If this BID is accepted by the Owner, the undersigned agrees to complete the entire work provided to be done under the Contract within Two Hundred Seventy (270) calendar days as stipulated in the AGREEMENT. Liquidated damages for each calendar day of delay shall be \$2,500.00 as stipulated in the AGREEMENT.

As provided in the Section 00100 – INSTRUCTIONS TO BIDDERS, the bidder hereby agrees that he will not withdraw this BID within Sixty (60) days, excluding Saturdays, Sundays and legal holidays after the actual date of the opening of Bids and that, if the Owner shall accept this BID, the bidder will duly execute and acknowledge the AGREEMENT and furnish, duly executed and acknowledged, the required CONTRACT BONDS within ten (10) days after notification that the AGREEMENT and other Contract Documents are ready for signature.

Should the bidder fail to fulfill any of his agreements as hereinabove set forth, the Owner shall have the right to retain as liquidated damages the amount of the bid check or cash which shall become the

Owner's property. If a bid bond was given, it is agreed that the amount thereof shall be paid as liquidated damages to the Owner by the Surety.

This BID includes Addenda number _____ (To be filled in by Bidder if Addenda are issued.)

The bidder, by submittal of this BID, agrees with the Owner that the amount of the bid security deposited with this BID fairly and reasonably represents the amount of damages the Owner will suffer due to the failure of the bidder to fulfill his agreements as above provided.

The undersigned certifies pursuant to M.G.L. Ch. 62C, Sec. 49A, under the penalties of perjury that I, to the best of my knowledge and belief, have filed all State tax returns and paid all State taxes required under law.

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individual.

(SEAL) _____ L.S.
(Name of Bidder)

By _____
(Signature and title of authorized representative)

(Telephone)

(Business address)

(Fax Number)

(City and State)

Date _____

The bidder is a corporation incorporated in the State (or Commonwealth) of _____ - a partnership - an individual. (Bidder must add and delete as necessary to make this sentence read correctly.)

(Note: If the bidder is a corporation, affix corporate seal and give below the names of its president, treasurer, and general manager if any; if a partnership, give full names and residential addresses of all partners; and if an individual, give residential address if different from business address.)

The required names and addresses of all persons interested in the foregoing Bid, as Principals, are as follows:

The bidder is requested to provide information on a minimum of three (3) projects similar to that included in the proposed Contract he has done and to give references that will enable the Owner to judge his experience, skill, and business standing.

Project Name	Contact Name	Title	Telephone No.

Add supplementary page if necessary.

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

(Name of person signing bid or proposal)

(Name of business)

CERTIFICATE OF OSHA REQUIREMENTS

The undersigned certifies that this business can work in harmony with all other elements of labor employed or the employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins works and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that it will comply fully with all laws and regulations applicable to awards made subject to section forty-four A of Chapter 149 of the General Laws.

(Name of person signing bid or proposal)

(Name of business)

CERTIFICATION OF BID

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

The bidder by signing the bid, or contract, under penalties of perjury certifies (1) that he is able to furnish labor that can work in harmony with other elements of labor employed or to be employed on the work site; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration. Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

Ch. 30, s39 (a) The undersigned certifies under penalties of perjury that this bid is in all respects bonafide, fair and made without collusion or fraud with any other person. As use in this paragraph the "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Certification undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provision of Section Twenty-Nine F of Chapter Twenty-Nine, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder.

_____ (Date)	_____ (Name of General Bidder)
By: _____ (Signature)	
_____ (Printed Title & Name of Person Signing Bid)	
_____ (Business Address)	_____ (City, State, Zip)

CONTRACTOR'S CERTIFICATION

A contractor will not be eligible for award of a contract unless such contractor has submitted the following certification, which is deemed a part of the resulting contract:

CONTRACTOR'S CERTIFICATION

Name of the General Contractor

certifies that:

1. It intends to use the following listed construction trades in the work under contract:

2. and will obtain from each of its subcontractors and submit to the contracting or administering agency prior to the award of any subcontract under this contract the subcontractor's certification required by these bid conditions.

Signature of Authorized
Representative or Contractor

SUBCONTRACTOR'S CERTIFICATION

Prior to the award of any subcontract, regardless of tier, the prospective subcontractor must execute and submit to the General Contractor the following certification, which will be deemed a part of the resulting subcontract:

SUBCONTRACTOR'S CERTIFICATION

Name of the Subcontractor

certifies that:

1. It intends to use the following construction trades in the work under the contract:

2. and will obtain from each of its subcontractors prior to the award of any subcontract under this contract the subcontractor's certification required by these bid conditions.

Signature of Authorized Representative of Subcontractor

END OF SECTION 00300

SECTION 00310

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____
_____, as Principal, and
_____, as Surety, are hereby held and
firmly bound unto the City of Salem, a municipality in the Commonwealth of Massachusetts in the penal
sum of _____ Dollars (\$_____), for the payment of which, well
and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators,
successors and assigns. Signed this _____ day of _____, _____. THE CONDITION
OF THE ABOVE OBLIGATION is such that whereas the Principal has submitted to the City of Salem,
Massachusetts, a certain bid attached hereto and hereby made a part hereof to enter into a contract in
writing for the "WASHINGTON STREET AND DODGE STREET UTILITY REMOVAL PROJECT"
for the City of Salem, Massachusetts.

NOW THEREFORE,

- a. If said Bid shall be rejected, or
- b. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the
Form of Contract attached hereto (properly completed in accordance with said Bid) and shall
furnish a bond for its faithful performance of said Contract, and for the payment of all
persons performing labor or furnishing materials in connection therewith, and shall in all
other respects perform the agreement created by the acceptance of said Bid,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly
understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event
exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall in no way be impaired or affected by any extension of the time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

SEAL

(Principal)

By _____

SEAL

(Surety)

Address _____

Telephone No. _____

Fax No. _____

END OF SECTION 00310

SECTION 00312
STATEMENT OF BIDDER'S QUALIFICATIONS

A bidder will not be eligible for award of the contract unless such bidder has submitted the following statement of qualifications for the prime contractor and any proposed sub-contractor(s) and both the prime contractor and any proposed sub-contractor(s) meets the minimum requirements as described herein.

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information it desires.

1. The names, titles, residences and Social Security numbers of all persons and parties interested in this Proposal as principals are as follows:

Note: Give the first and last names in full. In the case of corporation, give names of officers and directors; in the case of a partnership, give names of all partners.

IMPORTANT: Be sure residences and Social Security Numbers are listed below.

Name	Title	Home Address	Social Security #
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. When organized.

3. If a corporation, where incorporated.

Bidder's Name _____
CITY OF SALEM
WASHINGTON ST. & DODGE ST.

STATEMENT OF BIDDERS
QUALIFICATIONS
00312-1

4. How many years have you been engaged in the construction of sewer, drain, and water pipe installation and replacement business under your present firm or trade name?

5. What projects similar to this one is your organization currently performing? Provide the following information:

(a) Name and Address of Owner for whom Work is being done

(b) Whether Work being done as Contractor or Sub-Contractor

(c) Description of Work

(d) Approximate Amount of Contract

(e) Approximate Completion Date of Work

Bidder's Name _____

CITY OF SALEM

WASHINGTON ST. & DODGE ST.

STATEMENT OF BIDDERS

QUALIFICATIONS

00312-2

6. **Minimum Requirements for contract award eligibility:**

Provide specific information (size and complexity), including referral and contact information, for at least three (3) similar projects completed by the prime contractor (and at least three (3) similar projects completed by any proposed sub-contractor) within the past five years, that involved 1) installation of 36-inch sanitary sewer pipe (or larger) at least 250 linear feet, 2) installation of 12-inch diameter water distribution of over 1,000 linear feet; 3) installation of 18-inch drain pipe (or larger) at least 500 linear feet, storm drain pipe at least 18-inches in diameter, of over 1,000 linear feet; 4) installation of sewer or drain pipe at least 20-feet deep; 5) installation and maintenance of bypass pumping for sewer or drain flow with wet weather capacity of at least 5 MGD; 6) installation of curbs, sidewalks and roadway paving of over 1,000 linear feet of project length; and 7) coordination with public and private utilities without significant delays to project progress. Positive reference checks for 3 projects meeting these required.

7. What is the general nature of work normally performed by your company, what is your annual gross revenue (last year and projected for the next two years), what is your total current revenue commitment (in dollars)?

8. Has your present organization ever failed to complete any work awarded to it? If so, state when, where, and why.

9. Has your present organization ever defaulted on a contract? If so, state when, where, and why.

10. Submit a preliminary project schedule.

11. Describe equipment available for the performance of this contract by setting forth make, model and year, size, number, and type for each such piece of equipment (a) owned, (b) currently rented or (c) to be rented. Bidder must set forth description of all equipment it plans to use whether rented or owned.

(a) Owned

(b) Rented

Bidder's Name _____

CITY OF SALEM

WASHINGTON ST. & DODGE ST.

STATEMENT OF BIDDERS

QUALIFICATIONS

00312-4

12. Background and experience of the principal member of your organization, including the officers.

13. Who will be the contractor's on site project manager? State such person's qualifications. Also list names of employees who will be participating in this contract and their qualifications (years of experience, etc.).

14. Who will be the contractor's full time on-site superintendent? Submit such person's resume for review by Owner/Engineer. Also, list names of employees who will be participating in this contract and their qualifications (years of experience, etc.).

15. Will you fill out a detailed financial statement and furnish any other information that may be required by the City of Salem, Massachusetts?

16. Employer Identification No. (Treasurer's No.)

17. Name, Signature, Social Security number and Title of officer preparing this proposal.

Name_____

Bidder's Name _____

CITY OF SALEM

WASHINGTON ST. & DODGE ST.

STATEMENT OF BIDDERS

QUALIFICATIONS

00312-5

Signature_____

Social Security

Number_____Title_____

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the City of Salem Engineering Department, in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated at _____ this _____ day of _____, 20____

(Signature)

Tel. No._____

BY_____

Title_____

State of _____)

as:

County of _____)

_____, being duly sworn,

deposes and says that he is _____ of

(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me this _____ day of _____, 20____

(Notary Public)

My commission expires _____, 20____

END OF SECTION 00312

Bidder's Name _____

CITY OF SALEM

WASHINGTON ST. & DODGE ST.

STATEMENT OF BIDDERS

QUALIFICATIONS

00312-6

SECTION 00450

CERTIFICATE AS TO CORPORATE BIDDER

I, _____, certify that I am the _____
of the Corporation named as bidder in the attached Bid Form; that _____,
who signed said Bid Form on behalf of the bidder was then _____ of
said Corporation; that I know his/her signature hereto is genuine and that said Bid Form was duly
signed, sealed and executed for and in behalf said Corporation by authority of its governing body.

(Corporate Seal)

By: _____
Name – Type or Print

Signature

This Certificate must be completed where Bidder is a Corporation and should be so completed by its Clerk. In the event that the Clerk is the person signing the Proposal on behalf of the Corporation, this certificate must be completed by another Officer of the Corporation.

END OF SECTION 00450

SECTION 00451

CERTIFICATE OF TAX COMPLIANCE

Date: _____

Pursuant to M.G.L. Chapter 62C, Section 49A, I certify under the penalties of perjury that I have filed all state tax returns and paid all state taxes required under law.

Social Security Number or
Federal Identification Number

Signature of Individual or Corporate Name

By: _____
Corporate Officer (if applicable)

This form shall be submitted by all bidders.

END OF SECTION 00451

SECTION 00500

AGREEMENT

INDEX

ARTICLE 1	WORK
ARTICLE 2	ENGINEER
ARTICLE 3	CONTRACT TIMES
ARTICLE 4	CONTRACT PRICE
ARTICLE 5	PAYMENT PROCEDURES
ARTICLE 6	INTEREST
ARTICLE 7	CONTRACTOR'S REPRESENTATIONS
ARTICLE 8	CONTRACT DOCUMENTS
ARTICLE 9	MISCELLANEOUS

SECTION 00500

AGREEMENT

CITY OF SALEM, MASSACHUSETTS

CONTRACT NO. _____

THIS AGREEMENT is dated as of the _____ day of _____ in the year 20____ by and between the City of Salem, Massachusetts, acting by and through its Engineering Department, duly authorized therefore, who acts herein solely for said City and without personal liability to itself, (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR).

OWNER AND CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is as described in Section 01010 – SUMMARY OF WORK.

ARTICLE 2. ENGINEER

The Project has been designed by New England Civil Engineering Corporation, 120 Washington St. Suite 202E, Salem, Massachusetts, who is hereinafter called ENGINEER and who is to act as OWNER'S representative, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIMES

- 3.1 The Work will be substantially completed on or before _____, 20____ and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions on or before _____, 20____.
- 3.2 Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER Two Thousand Five Hundred dollars (\$2,500.00) for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete.

ARTICLE 4. CONTRACT PRICE

OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the prices stipulated in the CONTRACTOR's BID attached to this Agreement.

ARTICLE 5. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

5.1 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 as provided in paragraphs 5.1.1 and 5.2 below. All such payments will be measured by the schedule of values established in paragraph 2.07 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.

5.1.1 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 14.02.B.5 of the General Conditions.

5.2 Final Payment. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 6. INTEREST

All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston, Massachusetts.

ARTICLE 7. CONTRACTOR'S REPRESENTATIONS

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

7.1 CONTRACTOR has examined and carefully studied the Contract Documents (including the Addenda listed in paragraph 8) and the other related data identified in the Bidding Documents including "technical data."

7.2 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.

- 7.3 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.
- 7.4 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.
- 7.5 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.
- 7.6 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 8. CONTRACT DOCUMENTS

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

- 8.1 Invitation to Bid.
- 8.2 Instructions to Bidders.
- 8.3 Contractor's Bid.
- 8.4 This Agreement.
- 8.5 Exhibits to this Agreement (pages ____ to ____, inclusive).
- 8.6 Performance, Payment, and other Bonds.
- 8.7 General Conditions EJCDC Document C-700, 2007 edition.
- 8.8 Supplementary Conditions.
- 8.9 Specifications as listed in table of contents thereof and Attachments to the Specifications.
 - 8.10 Drawings consisting of a cover sheet and sheets G-1 through G-2, C-1 through C-17, and D-1 through D-7; dated August 2015 with each sheet bearing the following general title:

"WASHINGTON STREET AND DODGE STREET UTILITY REPLACEMENT PROJECT"

- 8.11 Addenda numbers ____ to ____, inclusive.

- 8.12 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 3.04 of the General Conditions.

ARTICLE 9. MISCELLANEOUS

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 9.2 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.
- 9.3 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.
- 9.4 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.
- 9.5 The contractor shall not discriminate against or exclude any person from participation herein on grounds of race, religion, color, sex, age, or national origin; and that it shall take affirmative actions to insure that applicants are employed, and that employees are treated during their employment, without regard to race, religion, color, sex, age, handicapped status, or national origin.
- 9.6 The contractor shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue code 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.
- 9.7 The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of this nondiscrimination clause.
- 9.8 The agreed upon Direct Labor Markup (percentage) for change orders on this project shall not exceed _____ percent.

- 9.9 The time to substantial completion of this contract is Two Hundred Seventy (270) calendar days.
- 9.10 Liquidated damages specified in this contract are \$5,000.00 per day for each calendar day beyond the contract completion date that work remains uncompleted.

IN WITNESS WHEREOF, OWNER AND CONTRACTOR have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed, initialed or identified by OWNER and CONTRACTOR or identified by ENGINEER on their behalf.

This Agreement will be effective on _____, 20____ (which is the Effective Date of the Agreement).

OWNER City of Salem, MA

CONTRACTOR _____

By: _____
 Kimberley Driscoll,
 Mayor

By: _____
 [CORPORATE SEAL]

Whitney Haskell,
Purchasing Agent

Attest _____

David H. Knowlton, P.E.
City Engineer

Address for giving notices

Address for giving notices

93 Washington Street, 2nd Floor
Salem, MA 01970

License No. _____

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

Agent for service of process: _____

(If CONTRACTOR is a corporation, attach
evidence of authority to sign.)

City Account # _____
Contract Amount _____

Sarah A. Stanton,
Finance Director/Auditor

END OF SECTION 00500

SECTION 00540

NOTICE OF AWARD

Date: _____

TO: _____
(Bidder)

(Bidder)

ADDRESS: _____

Contract: WASHINGTON STREET AND DODGE STREET UTILITY REPLACEMENT PROJECT

Project: _____

OWNERS Contract No. _____

You are notified that your Bid dated _____ for the above Contract has been considered and that you are the apparent successful bidder for the construction of the above Contract.

The Contract Price of your contract is _____ Dollars (\$) _____)

Dollars (\$)

Three copies of the Contract Documents (except Drawings) accompany this Notice of Award. Three sets of the Drawings will be delivered separately or otherwise made available to you.

You must comply with the following conditions precedent within ten days of the date of this Notice of Award, that is by _____
(Date)

(Date)

1. You must deliver to the OWNER three fully executed counterparts of the Agreement including all the Contract Documents. This includes the triplicate sets of Drawings. Each of the Contract Documents must bear your signature on the cover.
2. You must deliver with the executed Agreement the Contract Security (Bonds) and Insurance Certificate as specified in the Information for Bidders and General Conditions.
3. List other conditions precedent.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within ten days after you comply with those conditions, OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

City of Salem
(Owner)

By: _____
(Authorized Signature)

(Title)

Copy to ENGINEER

END OF SECTION 00540

SECTION 00560

NOTICE TO PROCEED

To: _____
(Contractor)

Date: _____

Project: WASHINGTON STREET AND

DODGE STREET UTILITY REPLACEMENT

PROJECT

You are hereby notified to commence the Work in accordance with the Agreement dated _____, 20____, on or before _____, 20____, and you are to substantially complete all work within Two Hundred Seventy consecutive calendar days thereafter. The date of substantial completion of all work is therefore _____, 20____. The date of final completion of all the work is therefore _____.

City of Salem
(Owner)

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged, this the _____ day of _____, 20____.

By _____

Title _____

END OF SECTION 00560

SECTION 00610

PERFORMANCE BOND

We, the undersigned, _____

(Name of Contractor)

(Address of Contractor)

_____ (Corporation, Partnership, or Individual), hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the City of Salem, hereinafter called Owner, in the penal sum of _____ Dollars (\$_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the ____ day of _____, 20____, a copy of which is attached hereto and made a part hereof, for the project known as "WASHINGTON STREET AND DODGE STREET UTILITY REPLACEMENT PROJECT," and the Principal and Surety bind themselves to the Owner for the performance of the contract.

Now, therefore, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during the guaranty period set forth in the contract, and if it shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner, its officers and agents from any and all costs and damages which it may suffer by a reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this bond shall remain in full force

and effect; provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the Specifications accompanying the same shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications. Provided, further, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed on this _____ day of _____, 20____.

CONTRACTOR AS PRINCIPAL

SURETY

(Signature)
Name and Title:

(Signature)
Name and Title:

SEAL

SEAL

Address

Telephone No.

Fax No.

END OF SECTION 00610

SECTION 00620
PAYMENT BOND

We, the undersigned, _____

_____,
(Name of Contractor)

(Address of Contractor)

_____ (Corporation, Partnership or Individual), hereinafter called Principal, and

_____,
(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the City of Salem, hereinafter called Owner, in the penal sum of _____ Dollars (\$_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the ____ day of _____ 20____, a copy of which is attached hereto and made a part hereof, for the project known as "WASHINGTON STREET AND DODGE STREET UTILITY REPLACEMENT PROJECT."

Now, therefore, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for all materials used in connection with the work, and all insurance premiums on said work, and for all labor performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise this bond is to remain in full force and effect. Provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the Specifications accompanying the same shall in

any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

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

IN WITNESS WHEREOF, this instrument is executed on this _____ day of _____, 20____.

CONTRACTOR AS PRINCIPAL

SURETY

(Signature)
Name and Title:

(Signature)
Name and Title:

SEAL

SEAL

Address

Telephone No.

Fax No.

END OF SECTION 00620

SECTION 00630
CERTIFICATE OF SUBSTANTIAL COMPLETION

DATE OF ISSUANCE _____

OWNER _____

CONTRACTOR _____

Contract: _____

Project: _____

OWNER's Contract No. _____ ENGINEER's Project No. _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To _____
OWNER

And To _____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

OWNER: _____

CONTRACTOR: _____

The following documents are attached to and made a part of this Certificate:

[For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by Contract Documents.]

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on _____
Date

ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____
Date

CONTRACTOR

By: _____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____
Date

OWNER

By: _____
(Authorized Signature)

END OF SECTION 00630

SECTION 00635
CHANGE ORDER

No. _____

Contract:	Date of Issuance: _____
-----------	-------------------------

OWNER:	OWNER's Contract No. _____
--------	----------------------------

CONTRACTOR:

ENGINEER: New England Civil Engineering Corp.	ENGINEER's Project No. _____
---	------------------------------

CONTRACTOR is directed to make the following changes in the Contract Documents.

1. Description of Work:
2. Purpose of Change Order:
3. Attachments: (List documents supporting change)

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIME
Original Contract Price \$ _____	Original Contract Time _____ (days or date)
Previous Change Orders No. ____ to No. ____ \$ _____	Net change from previous Change Orders _____ (days)
Contract Price prior to this Change Order \$ _____	Contract Time prior to this Change Order _____ (days or date)
Net (Increase/Decrease) of this Change Order \$ _____	Net (Increase/Decrease) of this Change Order _____ (days)
Contract Price with all approved Change Orders \$ _____	Contract Time with all approved Change Orders _____ (days or date)

RECOMMENDED:

By: _____
(Engineer)

Date: _____

APPROVED:

By: _____
(Owner)

Date: _____

ACCEPTED:

By: _____
(Contractor)

Date: _____

END OF SECTION 00635

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

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

Copyright © 2007 National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

The copyright for this EJCDC document is owned jointly by the four
EJCDC sponsoring organizations and held in trust for their benefit by NSPE.

STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology	6
1.01 Defined Terms	6
1.02 Terminology	9
Article 2 – Preliminary Matters	9
2.01 Delivery of Bonds and Evidence of Insurance	9
2.02 Copies of Documents	10
2.03 Commencement of Contract Times; Notice to Proceed	10
2.04 Starting the Work	10
2.05 Before Starting Construction	10
2.06 Preconstruction Conference; Designation of Authorized Representatives	10
2.07 Initial Acceptance of Schedules	10
Article 3 – Contract Documents: Intent, Amending, Reuse	11
3.01 Intent	11
3.02 Reference Standards	11
3.03 Reporting and Resolving Discrepancies	11
3.04 Amending and Supplementing Contract Documents	12
3.05 Reuse of Documents	12
3.06 Electronic Data	12
Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points	12
4.01 Availability of Lands	12
4.02 Subsurface and Physical Conditions	13
4.03 Differing Subsurface or Physical Conditions	13
4.04 Underground Facilities	14
4.05 Reference Points	15
4.06 Hazardous Environmental Condition at Site	15
Article 5 – Bonds and Insurance	16
5.01 Performance, Payment, and Other Bonds	16
5.02 Licensed Sureties and Insurers	17
5.03 Certificates of Insurance	17
5.04 Contractor’s Insurance	17
5.05 Owner’s Liability Insurance	18
5.06 Property Insurance	18
5.07 Waiver of Rights	19
5.08 Receipt and Application of Insurance Proceeds	20
5.09 Acceptance of Bonds and Insurance; Option to Replace	20
5.10 Partial Utilization, Acknowledgment of Property Insurer	20
Article 6 – Contractor’s Responsibilities	21
6.01 Supervision and Superintendence	21
6.02 Labor; Working Hours	21
6.03 Services, Materials, and Equipment	21
6.04 Progress Schedule	21
6.05 Substitutes and “Or-Equals”	21
6.06 Concerning Subcontractors, Suppliers, and Others	23

6.07	Patent Fees and Royalties.....	24
6.08	Permits	25
6.09	Laws and Regulations	25
6.10	Taxes.....	25
6.11	Use of Site and Other Areas.....	25
6.12	Record Documents	26
6.13	Safety and Protection.....	26
6.14	Safety Representative	27
6.15	Hazard Communication Programs	27
6.16	Emergencies.....	27
6.17	Shop Drawings and Samples.....	27
6.18	Continuing the Work.....	28
6.19	Contractor's General Warranty and Guarantee	28
6.20	Indemnification.....	29
6.21	Delegation of Professional Design Services.....	29
Article 7 – Other Work at the Site		30
7.01	Related Work at Site.....	30
7.02	Coordination	30
7.03	Legal Relationships	31
Article 8 – Owner's Responsibilities		31
8.01	Communications to Contractor	31
8.02	Replacement of Engineer	31
8.03	Furnish Data	31
8.04	Pay When Due.....	31
8.05	Lands and Easements; Reports and Tests	31
8.06	Insurance.....	31
8.07	Change Orders.....	31
8.08	Inspections, Tests, and Approvals.....	31
8.09	Limitations on Owner's Responsibilities.....	31
8.10	Undisclosed Hazardous Environmental Condition.....	31
8.11	Evidence of Financial Arrangements.....	31
8.12	Compliance with Safety Program	31
Article 9 – Engineer's Status During Construction		32
9.01	Owner's Representative	32
9.02	Visits to Site.....	32
9.03	Project Representative.....	32
9.04	Authorized Variations in Work.....	32
9.05	Rejecting Defective Work.....	32
9.06	Shop Drawings, Change Orders and Payments.....	32
9.07	Determinations for Unit Price Work.....	33
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work	33
9.09	Limitations on Engineer's Authority and Responsibilities.....	33
9.10	Compliance with Safety Program	34
Article 10 – Changes in the Work; Claims		34
10.01	Authorized Changes in the Work.....	34
10.02	Unauthorized Changes in the Work.....	34
10.03	Execution of Change Orders	34
10.04	Notification to Surety	34
10.05	Claims.....	34
Article 11 – Cost of the Work; Allowances; Unit Price Work.....		35
11.01	Cost of the Work	35

11.02	Allowances	37
11.03	Unit Price Work	37
Article 12 – Change of Contract Price; Change of Contract Times		38
12.01	Change of Contract Price	38
12.02	Change of Contract Times	39
12.03	Delays	39
Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work		39
13.01	Notice of Defects	39
13.02	Access to Work	39
13.03	Tests and Inspections	40
13.04	Uncovering Work	40
13.05	Owner May Stop the Work	40
13.06	Correction or Removal of Defective Work	41
13.07	Correction Period	41
13.08	Acceptance of Defective Work	41
13.09	Owner May Correct Defective Work	42
Article 14 – Payments to Contractor and Completion		42
14.01	Schedule of Values	42
14.02	Progress Payments	42
14.03	Contractor’s Warranty of Title	44
14.04	Substantial Completion	44
14.05	Partial Utilization	45
14.06	Final Inspection	45
14.07	Final Payment	46
14.08	Final Completion Delayed	46
14.09	Waiver of Claims	47
Article 15 – Suspension of Work and Termination		47
15.01	Owner May Suspend Work	47
15.02	Owner May Terminate for Cause	47
15.03	Owner May Terminate For Convenience	48
15.04	Contractor May Stop Work or Terminate	48
Article 16 – Dispute Resolution		48
16.01	Methods and Procedures	48
Article 17 – Miscellaneous		49
17.01	Giving Notice	49
17.02	Computation of Times	49
17.03	Cumulative Remedies	49
17.04	Survival of Obligations	49
17.05	Controlling Law	49
17.06	Headings	49

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. 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 which is evidence of the agreement between Owner and Contractor covering the Work.
 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. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer 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, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
 13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
 14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
 15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
 16. *Cost of the Work*—See Paragraph 11.01 for definition.
 17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be

performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given 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 under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *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.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work

- and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *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.
40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *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 at the Site.
44. *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.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *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 Subcontractor.
48. *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 those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *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, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its

effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The words and terms discussed in Paragraph 1.02.B through F 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 Paragraph 9.09 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 14.04 or 14.05).

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. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
- 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. 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 Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional

insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *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 Agreement 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 Agreement. 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 Agreement, whichever date is earlier.

2.04 *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 the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), 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 Documents;
 - 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.

2.06 *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 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, 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 instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *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 2.05.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 component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, 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. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 Reference Standards

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, 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, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement 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, 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 Contract Documents. 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 Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies:

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, 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) any standard, specification, manual, or code, or (c) 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 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
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 Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

- a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); 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 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier 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
 2. 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.

- 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.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *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. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

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 the Work is to be performed 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.

4.02 *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 contiguous to the Site; and
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "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.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed 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 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; 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 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition 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 meet any one or more of the categories described in Paragraph 4.03.A; and
 - 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 Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final 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
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous 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 shall not be responsible for 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 such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, 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 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the

extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *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.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "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 any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) 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 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. 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, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. 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. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. 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: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by

Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. 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 a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, 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 Documents. 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 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds 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 each bond.

- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, 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 requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which 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:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. 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; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and 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;
2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a

certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, 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.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full 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 interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property

(including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible

amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their 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 Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (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 as trustee 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 utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's

exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, 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. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *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. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

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.

6.02 *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. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *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.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, 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.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 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 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and “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 specification or description 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 or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be

submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion 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, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, 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; and
 - 3) it has a proven record of performance and availability of responsive service.
- 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.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

d. 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:

1) shall certify that the proposed substitute item will:

- a) perform adequately the functions and achieve the results called for by the general design,
- b) be similar in substance to that specified, and
- c) be suited to the same use as that specified;

2) will state:

- a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
- b) 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

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- 6.06
- B. *Substitute Construction Methods or Procedures:*** If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:*** Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:*** Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:*** Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. 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.
- F. *Contractor's Expense:*** Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.
- 6.06 *Concerning Subcontractors, Suppliers, and Others***
- A.** Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B.** If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. 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 any right of Owner or Engineer to reject defective Work.

- C. 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. 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 moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

- F. 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.

- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and

all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (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 such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *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.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, 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 opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *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 knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear 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. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the

Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. 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 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 by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other 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 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 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 property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. 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, 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 owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- 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 6.13.A.2 or 6.13.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 (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 for protection of the Work 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 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *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.

6.15 *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.

6.16 *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.

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- 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 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. 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 6.17.D.

- B. 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. *Submittal Procedures:*

- 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each 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 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 and approval of that 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 both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

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 (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate

approval of the assembly in which the item functions.

3. Engineer's review and approval 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 6.17.C.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's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

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.

Continuing the Work

- A. 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, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

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 representation of 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 or the issuance of a notice of acceptability by Engineer;
 6. any inspection, test, or approval by others; or
 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. 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 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 6.20.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 6.20.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.

6.21 *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 law.
- 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, Shop Drawings 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 6.21, 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 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. 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. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, 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.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.09 *Limitations on Owner's Responsibilities*

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

- 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.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.10 *Undisclosed Hazardous Environmental Condition*

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.11 *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.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to

8.12 *Compliance with Safety Program*

- 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 pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER’S STATUS DURING CONSTRUCTION

9.01 *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 Documents.

9.02 *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 9.09. 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.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of

any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. 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.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which 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. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer’s authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with 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, see Paragraph 6.21.

- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. 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 Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show

partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents 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 14.07.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 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *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 by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *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 as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. 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; and
3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *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.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional

or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and

paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs 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 11.01.B, 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, 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 11.01.

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 5.06.D), 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 telegrams, long distance telephone calls, telephone 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 Contractor is required by the Contract Documents to purchase and maintain.

- B. *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 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which 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 Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work 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 or when a Claim for an 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 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, 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.

11.02 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:*

1. Contractor agrees that:
 - a. 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
 - b. 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:*

1. 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.

11.03 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. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

- 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. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 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; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor 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.
- 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee:* 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 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.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 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - 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

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for 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, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

- 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 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, 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 Price or the Contract Times, or both. 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.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the

control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is 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 described in this Paragraph 12.03.C.

- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests 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.

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- 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 and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. 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.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and

Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, 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, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, 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 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 Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. 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, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *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, 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.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. 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 removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *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 land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
2. correct such defective Work; or
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 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. 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) will be paid by Contractor.

- 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 13.07, 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 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. 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) 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 pursuant to this sentence. If any such acceptance occurs prior to

Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *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 in accordance with Paragraph 13.06.A, 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, 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 13.09, 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, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, 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 (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) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work;

and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. 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 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A 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.

14.02 *Progress Payments*

A. 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 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.

B. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, 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 9.07, 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 Documents; 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 moneys 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 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action 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, when Contractor remedies the reasons for such action.
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 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. 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;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events

- 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 (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- 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 tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to

make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. 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 tentative list.

14.05 *Partial Utilization*

- 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. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and

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 14.04.A through D for that part of the Work.

- 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and 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 14.04 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 5.10 regarding property insurance.

14.06 *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 is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *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, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) 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.

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 Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. 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 14.09. 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. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and

accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *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 notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will 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 established

under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. 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

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.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 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed 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.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. 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. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *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;
3. 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) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) 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 15.03.

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 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 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 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

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

- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
2. agrees with the other party to submit the Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *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 to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents 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.

17.03 *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 Documents. 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.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

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

SECTION 00800

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC No. C-100, 2007 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.12

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

The Invitation to Bid, Instructions to Bidders, and Specifications Divisions 0, 1, 2, 3...

SC-1.01.A.29

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

The term "Owner" shall mean the City of Salem, Massachusetts acting through its Engineering Department.

SC-1.01.A.44

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.

ARTICLE 2. PRELIMINARY MATTERS

SC-2.01.B

Delete paragraph 2.01.B of the General Conditions in its entirety and insert the following in its place:

2.01.B Before any work at the site is started, Contractor shall deliver to Owner, with a copy to Engineer and each additional insured in Article 5, 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 5.

2.01.B.1 Contractor shall include and identify on the certificate of insurance, indemnification as required by Article 6.20 of the General Conditions (Section 00700).

SC-2.03

Delete paragraph 2.03 of the General Conditions in its entirety and insert the following in its place:

2.03.A The Contract Time will commence to run on the effective date of the Agreement.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01

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

3.01.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.

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

ARTICLE 4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

SC-4.01.A

Add the followings new paragraph immediately after paragraph 4.01A of the General Conditions which is to read as follows:

1. If all lands and right-of-ways are not obtained as herein contemplated before construction begins, Contractor shall begin the Work upon such land and right-of-ways as Owner has previously required.

SC-4.03.3

Add the followings new paragraph immediately after paragraph 4.03C.3 of the General Conditions which is to read as follows:

D. Adjust resulting from subsurface or latent physical conditions will be in accordance with Massachusetts General Law Chapter 30, Section 39N included in Section 01069 - Massachusetts General Laws, located in Division 1 of this specification document.

SC-4.03.3

Add the followings new paragraph immediately after paragraph 4.05.A of the General Conditions which is to read as follows:

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 construction of the entire Work. Contractor shall furnish personnel to assist Engineer in checking lines and grades.

ARTICLE 5. BONDS AND INSURANCE

SC-5.01

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

(1) General Aggregate	
(Except Products--Completed Operations)	\$1,000,000
(2) Products--Completed Operations Aggregate	\$1,000,000
(3) Personal and Advertising Injury (Per Person/Organization)	\$1,000,000
(4) Each Occurrence (Bodily Injury and Property Damage)	\$1,000,000
(5) Property Damage liability insurance including Collapse, and Underground coverages. If blasting is to be used, also include explosion coverage.	\$1,000,000
(6) General Aggregate	\$2,000,000
Each Occurrence	\$1,000,000

5.04.A.6 Automobile Liability:

(1) Bodily Injury:	\$1,000,000 Each Person
	\$1,000,000 Each Accident
Property Damage:	\$1,000,000 Each Accident
or	
(2) Combined Single Limit (Bodily Injury and Property Damage):	\$2,000,000 Each Accident

SC-5.04.B.4 The Contractual Liability coverage required by paragraph 5.04.B.4 in the General Conditions shall provide coverage for not less than the following amounts:

(1) General Aggregate	\$2,000,000
(2) Each Occurrence (Bodily Injury and Property Damage)	\$1,000,000

SC-5.04.B.6

Add two new paragraphs immediately after paragraph 5.04.B.6.b of the General Conditions which is to read as follows:

7. Contractor may purchase and maintain excess liability insurance in the umbrella form in order to satisfy the minimum amounts required for the insurance to be purchased and maintained in accordance with paragraph 5.04. Evidence of such excess liability insurance shall be delivered to Owner in accordance with paragraph 2.01B in the form of certificate indicating the policy numbers and minimum coverage amounts of all underlying insurance. The umbrella liability insurance shall have a combined single limit of not less than \$5,000,000.

8. Contactor shall list the Owner and Engineer as additional insured parties on all policies. All policies required by this paragraph 5.04 shall contain provisions to the effect that the insurer(s) waive all rights of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

SC-5.05

Delete paragraph 5.05 of the General Conditions in its entirety and insert the following in its place:

5.05.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:

5.05.A.1	Bodily Injury:	\$1,000,000 Each Occurrence
5.05.A.2	Property Damage:	\$1,000,000 Each Occurrence \$1,000,000 Annual Aggregate

SC-5.05.A

Add the following new paragraph immediately after paragraph 5.05.A.2 of the General Conditions which is to read as follows:

B. Contactor shall list the Owner and Engineer as additional insured parties on all policies. All policies required by this paragraph 5.05 shall contain provisions to the effect that the insurer(s) waive all rights of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

SC-5.06

Delete paragraph 5.06 of the General Conditions in its entirety.

SC-5.09.A

Delete paragraph 5.09.A of the General Conditions in its entirety and replace with the following:

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 5 on the basis of its not complying with the Contract Documents, Owner will notify Contractor in writing thereof within ten days of the date of delivery of such certificates to Owner in accordance with paragraph 2.01. Contractor will provide such additional information in respect of insurance provided by Contractor as Owner may reasonably request.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

SC-6.02

Add the following 2 paragraphs immediately after paragraph 6.02.B of the General Conditions which are to read as follows:

C. Regular working hours are defined as 8 hours per day, Monday through Friday, excluding holidays, between the hours of 7:00 A.M. and 5:00 P.M. Requests to work other than regular working hours shall be submitted to the Engineer not less than 48 hours prior to any proposed weekend work or scheduled extended work weeks. Occasional unscheduled overtime on weekdays may be permitted provided two hours notice is given to the Engineer.

D. Contractor shall reimburse the Owner for additional engineering and/or inspection costs incurred as a result of overtime work in excess of the regular working hours stipulated in Article SC-6.02.C. At Owner's opinion, overtime costs may either be deducted from the Contractor's monthly payment request or deducted from the Contractor's retention prior to release of final payment. Overtime costs for the Owner's personnel shall be based on the individual's current overtime wage rate. Overtime costs for personnel employed by the Engineer or Owner's independent testing laboratory shall be calculated in accordance with the terms of their respective contracts with the Owner.

SC-6.02.B

Add the following new paragraphs immediately after paragraph 6.02.B of the General Conditions which are to read as follows:

C. This agreement is subject to the applicable provisions of the Contract Work Hours and Safety Standards Act, Public Law 87-581, 87th Congress. No Contractor or Subcontractor contracting for any part of the Work shall require or permit any laborer or mechanic to be employed on the Work in excess of forty hours in any work week unless such labor or mechanic receives compensation at a rate not less than one and one-half times that person's basic rate of pay for all hours worked in excess of forty hours in such work week.

D. Contractor shall employ only competent persons to do the work and whenever Owner shall notify Contractor, in writing, that any person on the Work appears to be incompetent, disorderly, or otherwise unsatisfactory, such person shall be removed from the Project and shall not again be employed on it except with the consent of the Owner.

E. Contractor and Subcontractor shall, insofar as practicable, give preference in the hiring of workers for the Project to qualified local residents with first preference being given to citizens of the United States who have served in the armed forces of the United States and have been honorably discharged therefrom or released from active duty therein.

F. Contractor and all Subcontractors shall comply with the Massachusetts Prevailing Wage law as contained in M.G.L. chapter 149 sections 26-27 which are included in Section 01069 – Massachusetts General Laws, located in Division 1 of this specification document.

SC-6.06.A

Delete paragraphs 6.06.A and 6.06.B of the General Conditions in their entirety and replace with the following:

A. Contractor shall not employ any Subcontractor, Supplier or other person or organization, (including those who are to furnish the principal items of materials or equipment), whether initially or as substitute, against whom Owner may have reasonable objection. Acceptance of any Subcontractor, other person or organization by Owner shall not constitute a waiver of any right of Owner to reject defective Work. Contractor shall not be required to employ and Subcontractor, other person or organization against whom Contractor has reasonable objection.

B. Not used.

SC-6.06.D

Add the following new subparagraph as follows:

6.06.D.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-6.08

Add the following language at the end of Paragraph 6.08.A of the General Conditions:

SC-6.10

Add the following language at the end of paragraph 6.10.A of the General Conditions:

6.10.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-6.16.A

Delete the last sentence in paragraph 6.16.A of the General Conditions in its entirety and replace with the following:

If Engineer determines that the incident giving rise to the emergency action was not the responsibility of the Contractor and that a change in the Contract Documents is required because of the action taken by the Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

SC-6.17

Add the following new paragraph immediately after paragraph 6.17.E of the General Conditions, which is to read as follows:

6.17.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.

SC-6.19.A

Add the following new paragraph immediately after paragraph 6.19.A of the General Conditions which is to read as follows:

B. The Contractor guarantees that the Work and Services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other Contract Documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of completion and acceptance of the Work as stated in the final estimate. If part of the Work is accepted accordance with that subsection of this AGREEMENT titled "Partial Acceptance," the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

1. If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, corrections or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

2. The Contractor's guarantee under this clause, 6.19.B, is in addition to the Contractor's express or implied warranties under this Agreement and State law and in no way diminish any other rights that the Owner may have against the Contractor.

SC-6.19.C and D

Renumber 6.19.B and 6.19.C of the General Conditions to read 6.19.C and 6.19.D

SC-6.19D

Add the following new paragraphs immediately after paragraph 6.19.D of the General Conditions which is to read as follows:

E. Manufacturer's Guaranty/Warranty

1. The Contractor shall obtain the following guaranty/warranty from the manufacturer of all major pieces of equipment furnished and installed on this Project. Such guaranty/warranty shall be for the benefit of Owner and be furnished in writing by the manufacturer. The Contractor's and manufacturer's obligations under this provision are in addition to other express or implied warranties under the Contract Documents and under the law and in no way diminish any other right that the Owner may have against the Contractor or manufacturer for faulty material, equipment or work. The warranty period shall not be interpreted as a limitation on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

2. The manufacturer warrants and guarantees for a period of one year from the date of Substantial Completion, or such longer period that may be specified in the Contract Documents, that all materials and equipment furnished and installed shall be free from flaws, defects in material and workmanship and shall be in conformance with the Contract Documents.

SC-6.20.A

Delete paragraphs 6.20.A of the General Conditions in its entirety and replace with the following:

A. To the fullest extent permitted by Laws and Regulations, Contractor shall defend, indemnify and hold harmless Owner, 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 or loss or damage:

1. is attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property (other than Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part 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, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such indemnified party unless caused by the sole negligence of a party indemnified hereunder. If through the acts of neglect on the part of Contractor, any other contractor or any Subcontractor shall suffer loss or damage on the Work, Contractor shall settle with such other contractor or Subcontractor by agreement or arbitration if such other contractor or Subcontractor will so settle. If such other contractor or Subcontractor shall assert any claim against Owner and/or Engineer, or the officers, directors, members, partners, employees, agents, consultants and subcontractors of each on account of any damage alleged to have been sustained, Owner shall notify Contractor, who shall defend, indemnify and save harmless Owner, Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each against any such claims.

SC-6.20.C

Delete paragraphs 6.20.C, C.1 and C.2 of the General Conditions in their entirety.

SC-6.21.E

Delete paragraph 6.21.E of the General Conditions in its entirety and replace with the following:

E. Contractors shall not be responsible for the adequacy of the performance criteria or design criteria contained in the Contract Documents.

SC-6.21.E

Add the following new paragraph immediately after paragraph 6.21.E of the General Conditions which is to read as follows:

SC-6.22 Definitions; Contract Provisions; Management and Financial Statements; Enforcement

A. Contractor shall comply with all applicable provisions of Chapter 30, Section 39R of the Massachusetts General Laws regarding Contractor's records which is included in Section 01069 – Massachusetts General Laws, located in Division 1 of this specification document.

ARTICLE 7. OTHER WORK AT THE SITE

ARTICLE 8. OWNER'S RESPONSIBILITIES

SC-8.06

Delete paragraph 8.06 of the General Conditions in its entirety.

ARTICLE 9. ENGINEER'S STATUS DURING CONSTRUCTION

SC-9.03

Add the following new paragraph immediately after paragraph 9.03.A of the General Conditions as follows:

9.03.A.1 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.

SC-9.04

Add the following new paragraph immediately after paragraph 9.04.A of the General Conditions which is to read as follows:

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

ARTICLE 10. CHANGES IN THE WORK; CLAIMS

SC-10.01.A

Add the following new paragraph immediately after paragraph 10.01A of the General Conditions, which is to read as follows:

10.01.A.1 Upon request of the Owner or the 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 fact 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. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the competition of the Work if the change or extra work is ordered.

SC-10.05.B

Replace paragraph 10.05.B of the General Conditions with the following paragraph:

10.05.B *Notice*: Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 7 calendar days) after the start of the event giving rise thereto. The responsibility to substantiate the Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data, shall be delivered to the Engineer and the other party to the Contract within 14 calendar days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed in the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

ARTICLE 11. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-11.01

In the second sentence of paragraph 11.01.A.1 delete the word "superintendents".

SC-11.02

Delete paragraph 11.02 of the General Conditions in its entirety.

SC-11.3.D

Delete paragraph 11.03.D of the General Conditions in its entirety and replace with the following:

D. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment under the following conditions:

1. if the total cost of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement; and
2. if there is no corresponding adjustment with respect to any other item of Work; and
3. if Contractor believes that Contractor has incurred additional expense as a result thereof; or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, either Owner or Contractor may make a claim of an adjustment in the Unit Price for that quantity by which the actual quantity exceeds 115% of the estimated quantity in accordance with Article 10.05 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

ARTICLE 12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

SC-12.01.C.2.b

In the second line of paragraph 12.01.C.2.b, before the semicolon add the following words "based on subcontractor's Cost of the Work";

**ARTICLE 13. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR
ACCEPTANCE OF DEFECTIVE WORK**

SC-13.05.A

Add the following new paragraph immediately after paragraph 13.05.A of the General Conditions to read as follows:

B. If Owner stops Work under paragraph 13.05.A Contractor shall not be entitled to any extension of Contract Time or increase in Contract Price.

SC-1307.A

Delete paragraph 13.07.A of the General Conditions in its entirety and replace with the following:

If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or 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, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions: (i) correct such defective work, or, if it has been rejected by Owner, remove it from the site and replace with work that is not defective, and (ii) satisfactory correct or remove and replace any damage to other work or the work of others therefrom. If Contractor does not begin the repairs within ten (10) days of receipt of written notification and promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk, loss or damage, Owner may have the defective work corrected or the rejected work removed and replaced, and all claims, costs, losses, and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

ARTICLE 14. PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02.A.3

Add the following new paragraph immediately after paragraph 14.02.A.3 of the General Conditions which is to read as follows:

1. Contractor shall furnish evidence that payment received on the basis of materials and equipment not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within sixty days of payment by Owner. Failure to provide such evidence of payment may result in the withdrawal of previous approval(s) and removal of the cost of related materials and equipment from the next submitted Application for Payment.

SC-14.02.B.1

Delete paragraph 14.02.B.1 of the General Conditions in its entirety and replace with the following:

1. Progress Payments will be made in accordance with Massachusetts General Law Chapter 30, Section 39G, which is included in Section 01069 – Massachusetts General Laws, located in Division 1 of this specification document.

ARTICLE 15. SUSPENSION OF WORK AND TERMINATION

SC-15.01.A

Delete paragraph 15.01.A of the General Conditions in its entirety and replace with the following:

- A. Owner may order, at any time and without cause, suspension of the Work in accordance with Massachusetts General Law Chapter 30, Section 39O, which is included in Section 01069 – Massachusetts General Laws, located in Division 1 of this specification document.

SC-15.02.A.4

Add the following new paragraph immediately after paragraph 15.02.A.4 of the General Conditions which is to read as follows

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

ARTICLE 16. DISPUTE RESOLUTION

SC-16.01.A

Delete the paragraph 16.01.A of the General Conditions in its entirety and replace with the following:

Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under paragraph 10.05 when such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of this Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract.

SC-16.01C.3

Add the following new paragraph immediately after paragraph 16.01.C of the General Conditions to read as follows:

- D. 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 17. MISCELLANEOUS

SC-17.06

Add the following new paragraphs immediately after paragraph 17.05 of the General Conditions to read as follows:

- A. The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder until thirty (30) days prior notice in writing has been given to the Owner or the intention to assign, which notice shall state the identity and address of the prospective assignee. No assignment shall be made without Owner's prior written consent. Such consent shall not be unreasonably withheld. In case the Contractor assigns all or any part of the moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract.

SC-17.07

Add the following new paragraph immediately after paragraph 17.06 of the General Conditions as follows:

SC-17.07 Legal Address of Contractor

17.07.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.

SC-17.07 Liability

It is understood and agreed that members of the Owner and the Engineer or any agent or employees of the Owner signing this Agreement shall not be personally liable hereunder for any actions incurred in connection with this Agreement

SC-17.08 State Statutes and Regulations

See Section 01069 – Massachusetts General Laws for further modifications of the General Conditions due to State Statutes and Regulations.

CS-17.09 If any provisions of this Agreement shall be invalid or unenforceable to any extent or in any application, then the remainder of this Agreement and of such terms and conditions, except to such extent or such application, shall not be affected thereby, and each and every term and condition of this Agreement shall be valid and enforced to the fullest extent and in the broadest application permitted by law.

END OF SECTION 00800



CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

RONALD L. WALKER, II
Secretary

WILLIAM D MCKINNEY
Director

Awarding Authority: City of Salem

Contract Number: R-11

City/Town: SALEM

Description of Work: Washington Street utility project

Job Location: Washington Street, Salem, MA 01970

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAS, the apprentice must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2015	\$31.65	\$9.91	\$9.33	\$0.00	\$50.89
	08/01/2015	\$31.65	\$10.41	\$9.33	\$0.00	\$51.39
	12/01/2015	\$31.65	\$10.41	\$10.08	\$0.00	\$52.14
	06/01/2016	\$32.15	\$10.41	\$10.08	\$0.00	\$52.64
	08/01/2016	\$32.15	\$10.91	\$10.08	\$0.00	\$53.14
	12/01/2016	\$32.15	\$10.91	\$10.89	\$0.00	\$53.95
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2015	\$31.72	\$9.91	\$9.33	\$0.00	\$50.96
	08/01/2015	\$31.72	\$10.41	\$9.33	\$0.00	\$51.46
	12/01/2015	\$31.72	\$10.41	\$10.08	\$0.00	\$52.21
	06/01/2016	\$32.22	\$10.41	\$10.08	\$0.00	\$52.71
	08/01/2016	\$32.22	\$10.91	\$10.08	\$0.00	\$53.21
	12/01/2016	\$32.22	\$10.91	\$10.89	\$0.00	\$54.02
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2015	\$31.84	\$9.91	\$9.33	\$0.00	\$51.08
	08/01/2015	\$31.84	\$10.41	\$9.33	\$0.00	\$51.58
	12/01/2015	\$31.84	\$10.41	\$10.08	\$0.00	\$52.33
	06/01/2016	\$32.34	\$10.41	\$10.08	\$0.00	\$52.83
	08/01/2016	\$32.34	\$10.91	\$10.08	\$0.00	\$53.33
	12/01/2016	\$32.34	\$10.91	\$10.89	\$0.00	\$54.14
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2014	\$87.36	\$9.80	\$18.17	\$0.00	\$115.33
	08/01/2015	\$90.51	\$9.80	\$18.17	\$0.00	\$118.48
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	12/01/2015	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	06/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
	12/01/2016	\$33.65	\$7.30	\$12.30	\$0.00	\$53.25
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	06/01/2015	\$33.43	\$10.40	\$5.95	\$0.00	\$49.78
	12/01/2015	\$34.38	\$10.40	\$5.95	\$0.00	\$50.73
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
	12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
	06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
	12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
	06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
	12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
	06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
	12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
	06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
LABORERS - ZONE 2	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER	06/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
LABORERS - ZONE 2	12/01/2015	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	06/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
	12/01/2016	\$33.65	\$7.30	\$12.30	\$0.00	\$53.25
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER	01/01/2010	\$37.70	\$6.97	\$11.18	\$0.00	\$55.85
BOILERMAKERS LOCAL 29						

Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2010

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$24.51	\$6.97	\$11.18	\$0.00	\$42.66
2	65	\$24.51	\$6.97	\$11.18	\$0.00	\$42.66
3	70	\$26.39	\$6.97	\$11.18	\$0.00	\$44.54
4	75	\$28.28	\$6.97	\$11.18	\$0.00	\$46.43
5	80	\$30.16	\$6.97	\$11.18	\$0.00	\$48.31
6	85	\$32.05	\$6.97	\$11.18	\$0.00	\$50.20
7	90	\$33.93	\$6.97	\$11.18	\$0.00	\$52.08
8	95	\$35.82	\$6.97	\$11.18	\$0.00	\$53.97

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)	02/01/2015	\$48.96	\$10.18	\$18.50	\$0.00	\$77.64
BRICKLAYERS LOCAL 3 (LYNN)	08/01/2015	\$49.86	\$10.18	\$18.57	\$0.00	\$78.61
	02/01/2016	\$50.43	\$10.18	\$18.57	\$0.00	\$79.18
	08/01/2016	\$51.33	\$10.18	\$18.65	\$0.00	\$80.16
	02/01/2017	\$51.90	\$10.18	\$18.65	\$0.00	\$80.73

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
----------------	----------------	-----------	--------	---------	------------------------------	------------

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Lynn

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.48	\$10.18	\$18.50	\$0.00	\$53.16
2	60	\$29.38	\$10.18	\$18.50	\$0.00	\$58.06
3	70	\$34.27	\$10.18	\$18.50	\$0.00	\$62.95
4	80	\$39.17	\$10.18	\$18.50	\$0.00	\$67.85
5	90	\$44.06	\$10.18	\$18.50	\$0.00	\$72.74

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.93	\$10.18	\$18.57	\$0.00	\$53.68
2	60	\$29.92	\$10.18	\$18.57	\$0.00	\$58.67
3	70	\$34.90	\$10.18	\$18.57	\$0.00	\$63.65
4	80	\$39.89	\$10.18	\$18.57	\$0.00	\$68.64
5	90	\$44.87	\$10.18	\$18.57	\$0.00	\$73.62

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN	06/01/2015	\$36.20	\$7.30	\$13.40	\$0.00	\$56.90
LABORERS - FOUNDATION AND MARINE	12/01/2015	\$36.95	\$7.30	\$13.40	\$0.00	\$57.65
	06/01/2016	\$37.70	\$7.30	\$13.40	\$0.00	\$58.40
	12/01/2016	\$38.70	\$7.30	\$13.40	\$0.00	\$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER	06/01/2015	\$35.05	\$7.30	\$13.40	\$0.00	\$55.75
LABORERS - FOUNDATION AND MARINE	12/01/2015	\$35.80	\$7.30	\$13.40	\$0.00	\$56.50
	06/01/2016	\$36.55	\$7.30	\$13.40	\$0.00	\$57.25
	12/01/2016	\$37.55	\$7.30	\$13.40	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN	06/01/2015	\$35.05	\$7.30	\$13.40	\$0.00	\$55.75
LABORERS - FOUNDATION AND MARINE	12/01/2015	\$35.80	\$7.30	\$13.40	\$0.00	\$56.50
	06/01/2016	\$36.55	\$7.30	\$13.40	\$0.00	\$57.25
	12/01/2016	\$37.55	\$7.30	\$13.40	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2015	\$35.75	\$9.80	\$16.48	\$0.00	\$62.03

Apprentice - CARPENTER - Zone 2 Eastern MA

Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.88	\$9.80	\$1.63	\$0.00	\$29.31
2	60	\$21.45	\$9.80	\$1.63	\$0.00	\$32.88
3	70	\$25.03	\$9.80	\$11.59	\$0.00	\$46.42
4	75	\$26.81	\$9.80	\$11.59	\$0.00	\$48.20
5	80	\$28.60	\$9.80	\$13.22	\$0.00	\$51.62
6	80	\$28.60	\$9.80	\$13.22	\$0.00	\$51.62
7	90	\$32.18	\$9.80	\$14.85	\$0.00	\$56.83
8	90	\$32.18	\$9.80	\$14.85	\$0.00	\$56.83

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING <i>BRICKLAYERS LOCAL 3 (LYNN)</i>	07/01/2015	\$45.82	\$10.90	\$18.71	\$1.30	\$76.73
	01/01/2016	\$46.44	\$10.90	\$18.71	\$1.30	\$77.35

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)
Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.91	\$10.90	\$12.21	\$0.00	\$46.02
2	60	\$27.49	\$10.90	\$13.71	\$1.30	\$53.40
3	65	\$29.78	\$10.90	\$14.71	\$1.30	\$56.69
4	70	\$32.07	\$10.90	\$15.71	\$1.30	\$59.98
5	75	\$34.37	\$10.90	\$16.71	\$1.30	\$63.28
6	80	\$36.66	\$10.90	\$17.71	\$1.30	\$66.57
7	90	\$41.24	\$10.90	\$18.71	\$1.30	\$72.15

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.22	\$10.90	\$12.21	\$0.00	\$46.33
2	60	\$27.86	\$10.90	\$13.71	\$1.30	\$53.77
3	65	\$30.19	\$10.90	\$14.71	\$1.30	\$57.10
4	70	\$32.51	\$10.90	\$15.71	\$1.30	\$60.42
5	75	\$34.83	\$10.90	\$16.71	\$1.30	\$63.74
6	80	\$37.15	\$10.90	\$17.71	\$1.30	\$67.06
7	90	\$41.80	\$10.90	\$18.71	\$1.30	\$72.71

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
LABORERS - ZONE 2	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	06/01/2015	\$43.83	\$10.00	\$14.55	\$0.00	\$68.38
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$45.08	\$10.00	\$14.55	\$0.00	\$69.63
	06/01/2016	\$45.83	\$10.00	\$14.55	\$0.00	\$70.38
	12/01/2016	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	06/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63
	12/01/2017	\$49.08	\$10.00	\$14.55	\$0.00	\$73.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR	06/01/2015	\$29.61	\$10.00	\$14.55	\$0.00	\$54.16
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$30.48	\$10.00	\$14.55	\$0.00	\$55.03
	06/01/2016	\$31.00	\$10.00	\$14.55	\$0.00	\$55.55
	12/01/2016	\$31.87	\$10.00	\$14.55	\$0.00	\$56.42
	06/01/2017	\$32.56	\$10.00	\$14.55	\$0.00	\$57.11
	12/01/2017	\$33.25	\$10.00	\$14.55	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE)	07/01/2015	\$48.56	\$7.85	\$16.10	\$0.00	\$72.51
<i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2016	\$49.51	\$7.85	\$16.10	\$0.00	\$73.46
	07/01/2016	\$50.46	\$7.85	\$16.10	\$0.00	\$74.41
	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.28	\$7.85	\$0.00	\$0.00	\$32.13
2	55	\$26.71	\$7.85	\$3.66	\$0.00	\$38.22
3	60	\$29.14	\$7.85	\$3.99	\$0.00	\$40.98
4	65	\$31.56	\$7.85	\$4.32	\$0.00	\$43.73
5	70	\$33.99	\$7.85	\$14.11	\$0.00	\$55.95
6	75	\$36.42	\$7.85	\$14.44	\$0.00	\$58.71
7	80	\$38.85	\$7.85	\$14.77	\$0.00	\$61.47
8	90	\$43.70	\$7.85	\$15.44	\$0.00	\$66.99

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.76	\$7.85	\$0.00	\$0.00	\$32.61
2	55	\$27.23	\$7.85	\$3.66	\$0.00	\$38.74
3	60	\$29.71	\$7.85	\$3.99	\$0.00	\$41.55
4	65	\$32.18	\$7.85	\$4.32	\$0.00	\$44.35
5	70	\$34.66	\$7.85	\$14.11	\$0.00	\$56.62
6	75	\$37.13	\$7.85	\$14.44	\$0.00	\$59.42
7	80	\$39.61	\$7.85	\$14.77	\$0.00	\$62.23
8	90	\$44.56	\$7.85	\$15.44	\$0.00	\$67.85

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN	06/01/2015	\$35.25	\$7.30	\$13.20	\$0.00	\$55.75
<i>LABORERS - ZONE 2</i>	12/01/2015	\$36.00	\$7.30	\$13.20	\$0.00	\$56.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR	06/01/2015	\$36.25	\$7.30	\$13.20	\$0.00	\$56.75
<i>LABORERS - ZONE 2</i>	12/01/2015	\$37.00	\$7.30	\$13.20	\$0.00	\$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS	06/01/2015	\$36.00	\$7.30	\$13.20	\$0.00	\$56.50
<i>LABORERS - ZONE 2</i>	12/01/2015	\$36.75	\$7.30	\$13.20	\$0.00	\$57.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER	06/01/2015	\$36.25	\$7.30	\$13.20	\$0.00	\$56.75
<i>LABORERS - ZONE 2</i>	12/01/2015	\$37.00	\$7.30	\$13.20	\$0.00	\$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR	06/01/2015	\$36.00	\$7.30	\$13.20	\$0.00	\$56.50
<i>LABORERS - ZONE 2</i>	12/01/2015	\$36.75	\$7.30	\$13.20	\$0.00	\$57.25

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER	06/01/2015	\$35.25	\$7.30	\$13.20	\$0.00	\$55.75
LABORERS - ZONE 2	12/01/2015	\$36.00	\$7.30	\$13.20	\$0.00	\$56.50
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER	08/01/2014	\$58.24	\$9.80	\$18.17	\$0.00	\$86.21
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2015	\$60.34	\$9.80	\$18.17	\$0.00	\$88.31
DIVER TENDER	08/01/2014	\$41.60	\$9.80	\$18.17	\$0.00	\$69.57
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2015	\$43.10	\$9.80	\$18.17	\$0.00	\$71.07
DIVER TENDER (EFFLUENT)	08/01/2014	\$62.40	\$9.80	\$18.17	\$0.00	\$90.37
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2015	\$64.65	\$9.80	\$18.17	\$0.00	\$92.62
DIVER/SLURRY (EFFLUENT)	08/01/2014	\$87.36	\$9.80	\$18.17	\$0.00	\$115.33
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2015	\$90.51	\$9.80	\$18.17	\$0.00	\$118.48
DRAWBRIDGE OPERATOR (Construction)	03/01/2015	\$45.17	\$13.00	\$15.40	\$0.00	\$73.57
ELECTRICIANS LOCAL 103	09/01/2015	\$46.13	\$13.00	\$15.43	\$0.00	\$74.56
	03/01/2016	\$47.08	\$13.00	\$15.46	\$0.00	\$75.54
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN	03/01/2015	\$45.17	\$13.00	\$15.40	\$0.00	\$73.57
ELECTRICIANS LOCAL 103	09/01/2015	\$46.13	\$13.00	\$15.43	\$0.00	\$74.56
	03/01/2016	\$47.08	\$13.00	\$15.46	\$0.00	\$75.54

Classification

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

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.07	\$13.00	\$0.54	\$0.00	\$31.61
2	40	\$18.07	\$13.00	\$0.54	\$0.00	\$31.61
3	45	\$20.33	\$13.00	\$11.64	\$0.00	\$44.97
4	45	\$20.33	\$13.00	\$11.64	\$0.00	\$44.97
5	50	\$22.59	\$13.00	\$11.98	\$0.00	\$47.57
6	55	\$24.84	\$13.00	\$12.33	\$0.00	\$50.17
7	60	\$27.10	\$13.00	\$12.66	\$0.00	\$52.76
8	65	\$29.36	\$13.00	\$13.01	\$0.00	\$55.37
9	70	\$31.62	\$13.00	\$13.35	\$0.00	\$57.97
10	75	\$33.88	\$13.00	\$13.70	\$0.00	\$60.58

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.45	\$13.00	\$0.55	\$0.00	\$32.00
2	40	\$18.45	\$13.00	\$0.55	\$0.00	\$32.00
3	45	\$20.76	\$13.00	\$11.65	\$0.00	\$45.41
4	45	\$20.76	\$13.00	\$11.65	\$0.00	\$45.41
5	50	\$23.07	\$13.00	\$11.99	\$0.00	\$48.06
6	55	\$25.37	\$13.00	\$12.34	\$0.00	\$50.71
7	60	\$27.68	\$13.00	\$12.68	\$0.00	\$53.36
8	65	\$29.98	\$13.00	\$13.03	\$0.00	\$56.01
9	70	\$32.29	\$13.00	\$13.37	\$0.00	\$58.66
10	75	\$34.60	\$13.00	\$13.72	\$0.00	\$61.32

Notes: :

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

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR	01/01/2015	\$53.30	\$13.58	\$14.21	\$0.00	\$81.09
ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2016	\$54.53	\$14.43	\$14.96	\$0.00	\$83.92
	01/01/2017	\$55.86	\$15.28	\$15.71	\$0.00	\$86.85

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - ELEVATOR CONSTRUCTOR - Local 4
Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.65	\$13.58	\$0.00	\$0.00	\$40.23
2	55	\$29.32	\$13.58	\$14.21	\$0.00	\$57.11
3	65	\$34.65	\$13.58	\$14.21	\$0.00	\$62.44
4	70	\$37.31	\$13.58	\$14.21	\$0.00	\$65.10
5	80	\$42.64	\$13.58	\$14.21	\$0.00	\$70.43

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.27	\$14.43	\$0.00	\$0.00	\$41.70
2	55	\$29.99	\$14.43	\$14.96	\$0.00	\$59.38
3	65	\$35.44	\$14.43	\$14.96	\$0.00	\$64.83
4	70	\$38.17	\$14.43	\$14.96	\$0.00	\$67.56
5	80	\$43.62	\$14.43	\$14.96	\$0.00	\$73.01

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2015	\$37.31	\$13.58	\$14.21	\$0.00	\$65.10
	01/01/2016	\$38.17	\$14.43	\$14.96	\$0.00	\$67.56
	01/01/2017	\$39.10	\$15.28	\$15.71	\$0.00	\$70.09
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2015	\$40.22	\$10.00	\$14.30	\$0.00	\$64.52
	11/01/2015	\$40.80	\$10.00	\$14.30	\$0.00	\$65.10
	05/01/2016	\$41.69	\$10.00	\$14.30	\$0.00	\$65.99
	11/01/2016	\$42.28	\$10.00	\$14.30	\$0.00	\$66.58
	05/01/2017	\$43.16	\$10.00	\$14.30	\$0.00	\$67.46
	11/01/2017	\$43.89	\$10.00	\$14.30	\$0.00	\$68.19
	05/01/2018	\$44.60	\$10.00	\$14.30	\$0.00	\$68.90
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2015	\$41.65	\$10.00	\$14.30	\$0.00	\$65.95
	11/01/2015	\$42.24	\$10.00	\$14.30	\$0.00	\$66.54
	05/01/2016	\$43.13	\$10.00	\$14.30	\$0.00	\$67.43
	11/01/2016	\$43.73	\$10.00	\$14.30	\$0.00	\$68.03
	05/01/2017	\$44.62	\$10.00	\$14.30	\$0.00	\$68.92
	11/01/2017	\$45.35	\$10.00	\$14.30	\$0.00	\$69.65
	05/01/2018	\$46.07	\$10.00	\$14.30	\$0.00	\$70.37
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2015	\$21.68	\$10.00	\$14.30	\$0.00	\$45.98
	11/01/2015	\$22.02	\$10.00	\$14.30	\$0.00	\$46.32
	05/01/2016	\$22.54	\$10.00	\$14.30	\$0.00	\$46.84
	11/01/2016	\$22.89	\$10.00	\$14.30	\$0.00	\$47.19
	05/01/2017	\$23.42	\$10.00	\$14.30	\$0.00	\$47.72
	11/01/2017	\$23.84	\$10.00	\$14.30	\$0.00	\$48.14
	05/01/2018	\$24.27	\$10.00	\$14.30	\$0.00	\$48.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2015	\$45.17	\$13.00	\$15.40	\$0.00	\$73.57
	09/01/2015	\$46.13	\$13.00	\$15.43	\$0.00	\$74.56
	03/01/2016	\$47.08	\$13.00	\$15.46	\$0.00	\$75.54
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS</i> <i>LOCAL 103</i>	03/01/2015	\$33.88	\$13.00	\$13.70	\$0.00	\$60.58
	09/01/2015	\$34.60	\$13.00	\$13.72	\$0.00	\$61.32
	03/01/2016	\$35.31	\$13.00	\$13.74	\$0.00	\$62.05
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$35.64	\$10.00	\$14.55	\$0.00	\$60.19
	12/01/2015	\$36.69	\$10.00	\$14.55	\$0.00	\$61.24
	06/01/2016	\$37.31	\$10.00	\$14.55	\$0.00	\$61.86
	12/01/2016	\$38.35	\$10.00	\$14.55	\$0.00	\$62.90
	06/01/2017	\$39.19	\$10.00	\$14.55	\$0.00	\$63.74
	12/01/2017	\$40.02	\$10.00	\$14.55	\$0.00	\$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER <i>LABORERS - ZONE 2</i>	06/01/2015	\$20.50	\$7.30	\$12.30	\$0.00	\$40.10
	12/01/2015	\$20.50	\$7.30	\$12.30	\$0.00	\$40.10
	06/01/2016	\$20.50	\$7.30	\$12.30	\$0.00	\$40.10
	12/01/2016	\$20.50	\$7.30	\$12.30	\$0.00	\$40.10
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE I</i>	09/01/2014	\$40.40	\$9.80	\$17.21	\$0.00	\$67.41

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - FLOORCOVERER - Local 2168 Zone I
Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.20	\$9.80	\$1.79	\$0.00	\$31.79
2	55	\$22.22	\$9.80	\$1.79	\$0.00	\$33.81
3	60	\$24.24	\$9.80	\$11.84	\$0.00	\$45.88
4	65	\$26.26	\$9.80	\$11.84	\$0.00	\$47.90
5	70	\$28.28	\$9.80	\$13.63	\$0.00	\$51.71
6	75	\$30.30	\$9.80	\$13.63	\$0.00	\$53.73
7	80	\$32.32	\$9.80	\$15.42	\$0.00	\$57.54
8	85	\$34.34	\$9.80	\$15.42	\$0.00	\$59.56

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER	06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
	06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
	12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
	06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATOR/LIGHTING PLANT/HEATERS	06/01/2015	\$29.61	\$10.00	\$14.55	\$0.00	\$54.16
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$30.48	\$10.00	\$14.55	\$0.00	\$55.03
	06/01/2016	\$31.00	\$10.00	\$14.55	\$0.00	\$55.55
	12/01/2016	\$31.87	\$10.00	\$14.55	\$0.00	\$56.42
	06/01/2017	\$32.56	\$10.00	\$14.55	\$0.00	\$57.11
	12/01/2017	\$33.25	\$10.00	\$14.55	\$0.00	\$57.80

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	07/01/2015	\$38.06	\$7.85	\$16.10	\$0.00	\$62.01
GLAZIERS LOCAL 35 (ZONE 2)	01/01/2016	\$39.01	\$7.85	\$16.10	\$0.00	\$62.96
	07/01/2016	\$39.96	\$7.85	\$16.10	\$0.00	\$63.91
	01/01/2017	\$40.91	\$7.85	\$16.10	\$0.00	\$64.86

Apprentice - GLAZIER - Local 35 Zone 2**Effective Date - 07/01/2015**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.03	\$7.85	\$0.00	\$0.00	\$26.88
2	55	\$20.93	\$7.85	\$3.66	\$0.00	\$32.44
3	60	\$22.84	\$7.85	\$3.99	\$0.00	\$34.68
4	65	\$24.74	\$7.85	\$4.32	\$0.00	\$36.91
5	70	\$26.64	\$7.85	\$14.11	\$0.00	\$48.60
6	75	\$28.55	\$7.85	\$14.44	\$0.00	\$50.84
7	80	\$30.45	\$7.85	\$14.77	\$0.00	\$53.07
8	90	\$34.25	\$7.85	\$15.44	\$0.00	\$57.54

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.51	\$7.85	\$0.00	\$0.00	\$27.36
2	55	\$21.46	\$7.85	\$3.66	\$0.00	\$32.97
3	60	\$23.41	\$7.85	\$3.99	\$0.00	\$35.25
4	65	\$25.36	\$7.85	\$4.32	\$0.00	\$37.53
5	70	\$27.31	\$7.85	\$14.11	\$0.00	\$49.27
6	75	\$29.26	\$7.85	\$14.44	\$0.00	\$51.55
7	80	\$31.21	\$7.85	\$14.77	\$0.00	\$53.83
8	90	\$35.11	\$7.85	\$15.44	\$0.00	\$58.40

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS

OPERATING ENGINEERS LOCAL 4

06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - OPERATING ENGINEERS - Local 4
Effective Date - 06/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$23.56	\$10.00	\$0.00	\$0.00	\$33.56
2	60	\$25.70	\$10.00	\$14.55	\$0.00	\$50.25
3	65	\$27.84	\$10.00	\$14.55	\$0.00	\$52.39
4	70	\$29.98	\$10.00	\$14.55	\$0.00	\$54.53
5	75	\$32.12	\$10.00	\$14.55	\$0.00	\$56.67
6	80	\$34.26	\$10.00	\$14.55	\$0.00	\$58.81
7	85	\$36.41	\$10.00	\$14.55	\$0.00	\$60.96
8	90	\$38.55	\$10.00	\$14.55	\$0.00	\$63.10

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$24.24	\$10.00	\$0.00	\$0.00	\$34.24
2	60	\$26.45	\$10.00	\$14.55	\$0.00	\$51.00
3	65	\$28.65	\$10.00	\$14.55	\$0.00	\$53.20
4	70	\$30.86	\$10.00	\$14.55	\$0.00	\$55.41
5	75	\$33.06	\$10.00	\$14.55	\$0.00	\$57.61
6	80	\$35.26	\$10.00	\$14.55	\$0.00	\$59.81
7	85	\$37.47	\$10.00	\$14.55	\$0.00	\$62.02
8	90	\$39.67	\$10.00	\$14.55	\$0.00	\$64.22

Notes:
Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK)	02/01/2015	\$43.28	\$10.20	\$20.54	\$2.22	\$76.24
SHEETMETAL WORKERS LOCAL 17 - A	08/01/2015	\$43.31	\$10.20	\$21.48	\$2.25	\$77.24
	02/01/2016	\$44.31	\$10.20	\$21.48	\$2.25	\$78.24
	08/01/2016	\$45.46	\$10.20	\$21.48	\$2.25	\$79.39
	02/01/2017	\$46.56	\$10.20	\$21.48	\$2.25	\$80.49
	08/01/2017	\$47.66	\$10.20	\$21.48	\$2.25	\$81.59
	02/01/2018	\$48.81	\$10.20	\$21.48	\$2.25	\$82.74

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS)	03/01/2015	\$45.17	\$13.00	\$15.40	\$0.00	\$73.57
ELECTRICIANS LOCAL 103	09/01/2015	\$46.13	\$13.00	\$15.43	\$0.00	\$74.56
	03/01/2016	\$47.08	\$13.00	\$15.46	\$0.00	\$75.54

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2015	\$43.28	\$10.20	\$20.54	\$2.22	\$76.24
	08/01/2015	\$43.31	\$10.20	\$21.48	\$2.25	\$77.24
	02/01/2016	\$44.31	\$10.20	\$21.48	\$2.25	\$78.24
	08/01/2016	\$45.46	\$10.20	\$21.48	\$2.25	\$79.39
	02/01/2017	\$46.56	\$10.20	\$21.48	\$2.25	\$80.49
	08/01/2017	\$47.66	\$10.20	\$21.48	\$2.25	\$81.59
	02/01/2018	\$48.81	\$10.20	\$21.48	\$2.25	\$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	03/01/2015	\$46.36	\$9.70	\$14.89	\$0.00	\$70.95
	09/01/2015	\$47.36	\$9.70	\$14.89	\$0.00	\$71.95
	03/01/2016	\$48.36	\$9.70	\$14.89	\$0.00	\$72.95
	09/01/2016	\$49.36	\$9.70	\$14.89	\$0.00	\$73.95
	03/01/2017	\$50.36	\$9.70	\$14.89	\$0.00	\$74.95
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	03/01/2015	\$46.36	\$9.70	\$14.89	\$0.00	\$70.95
	09/01/2015	\$47.36	\$9.70	\$14.89	\$0.00	\$71.95
	03/01/2016	\$48.36	\$9.70	\$14.89	\$0.00	\$72.95
	09/01/2016	\$49.36	\$9.70	\$14.89	\$0.00	\$73.95
	03/01/2017	\$50.36	\$9.70	\$14.89	\$0.00	\$74.95
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	12/01/2015	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	06/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
	12/01/2016	\$33.65	\$7.30	\$12.30	\$0.00	\$53.25
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2014	\$43.31	\$11.25	\$12.60	\$0.00	\$67.16

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

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.66	\$11.25	\$9.35	\$0.00	\$42.26
2	60	\$25.99	\$11.25	\$10.00	\$0.00	\$47.24
3	70	\$30.32	\$11.25	\$10.65	\$0.00	\$52.22
4	80	\$34.65	\$11.25	\$11.30	\$0.00	\$57.20

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i>	03/16/2015	\$42.11	\$7.70	\$20.25	\$0.00	\$70.06
---	------------	---------	--------	---------	--------	---------

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - IRONWORKER - Local 7 Boston
Effective Date - 03/16/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$25.27	\$7.70	\$20.25	\$0.00	\$53.22
2	70	\$29.48	\$7.70	\$20.25	\$0.00	\$57.43
3	75	\$31.58	\$7.70	\$20.25	\$0.00	\$59.53
4	80	\$33.69	\$7.70	\$20.25	\$0.00	\$61.64
5	85	\$35.79	\$7.70	\$20.25	\$0.00	\$63.74
6	90	\$37.90	\$7.70	\$20.25	\$0.00	\$65.85

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**
JACKHAMMER & PAVING BREAKER OPERATOR
LABORERS - ZONE 2

06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75

For apprentice rates see "Apprentice- LABORER"

LABORER
LABORERS - ZONE 2

06/01/2015	\$31.15	\$7.30	\$12.30	\$0.00	\$50.75
12/01/2015	\$31.65	\$7.30	\$12.30	\$0.00	\$51.25
06/01/2016	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
12/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50

Apprentice - LABORER - Zone 2
Effective Date - 06/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$18.69	\$7.30	\$12.30	\$0.00	\$38.29
2	70	\$21.81	\$7.30	\$12.30	\$0.00	\$41.41
3	80	\$24.92	\$7.30	\$12.30	\$0.00	\$44.52
4	90	\$28.04	\$7.30	\$12.30	\$0.00	\$47.64

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$18.99	\$7.30	\$12.30	\$0.00	\$38.59
2	70	\$22.16	\$7.30	\$12.30	\$0.00	\$41.76
3	80	\$25.32	\$7.30	\$12.30	\$0.00	\$44.92
4	90	\$28.49	\$7.30	\$12.30	\$0.00	\$48.09

Notes:
Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.15	\$7.30	\$12.30	\$0.00	\$50.75
	12/01/2015	\$31.65	\$7.30	\$12.30	\$0.00	\$51.25
	06/01/2016	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
	12/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.15	\$7.30	\$12.30	\$0.00	\$50.75
	12/01/2015	\$31.65	\$7.30	\$12.30	\$0.00	\$51.25
	06/01/2016	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
	12/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.35	\$7.30	\$12.25	\$0.00	\$50.90
	12/01/2015	\$31.85	\$7.30	\$12.25	\$0.00	\$51.40
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.15	\$7.30	\$12.30	\$0.00	\$50.75
	12/01/2015	\$31.65	\$7.30	\$12.30	\$0.00	\$51.25
	06/01/2016	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
	12/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.15	\$7.30	\$12.30	\$0.00	\$50.75
	12/01/2015	\$31.65	\$7.30	\$12.30	\$0.00	\$51.25
	06/01/2016	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
	12/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2015	\$37.37	\$10.18	\$17.18	\$0.00	\$64.73
	08/01/2015	\$38.08	\$10.18	\$17.25	\$0.00	\$65.51
	02/01/2016	\$38.53	\$10.18	\$17.25	\$0.00	\$65.96
	08/01/2016	\$39.23	\$10.18	\$17.33	\$0.00	\$66.74
	02/01/2017	\$39.69	\$10.18	\$17.33	\$0.00	\$67.20

Classification

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

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.69	\$10.18	\$17.18	\$0.00	\$46.05
2	60	\$22.42	\$10.18	\$17.18	\$0.00	\$49.78
3	70	\$26.16	\$10.18	\$17.18	\$0.00	\$53.52
4	80	\$29.90	\$10.18	\$17.18	\$0.00	\$57.26
5	90	\$33.63	\$10.18	\$17.18	\$0.00	\$60.99

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.04	\$10.18	\$17.25	\$0.00	\$46.47
2	60	\$22.85	\$10.18	\$17.25	\$0.00	\$50.28
3	70	\$26.66	\$10.18	\$17.25	\$0.00	\$54.09
4	80	\$30.46	\$10.18	\$17.25	\$0.00	\$57.89
5	90	\$34.27	\$10.18	\$17.25	\$0.00	\$61.70

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH	02/01/2015	\$49.00	\$10.18	\$18.50	\$0.00	\$77.68
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2015	\$49.90	\$10.18	\$18.57	\$0.00	\$78.65
	02/01/2016	\$50.47	\$10.18	\$18.57	\$0.00	\$79.22
	08/01/2016	\$51.37	\$10.18	\$18.65	\$0.00	\$80.20
	02/01/2017	\$51.94	\$10.18	\$18.65	\$0.00	\$80.77

Classification

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

Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile
Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.50	\$10.18	\$18.50	\$0.00	\$53.18
2	60	\$29.40	\$10.18	\$18.50	\$0.00	\$58.08
3	70	\$34.30	\$10.18	\$18.50	\$0.00	\$62.98
4	80	\$39.20	\$10.18	\$18.50	\$0.00	\$67.88
5	90	\$44.10	\$10.18	\$18.50	\$0.00	\$72.78

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.95	\$10.18	\$18.57	\$0.00	\$53.70
2	60	\$29.94	\$10.18	\$18.57	\$0.00	\$58.69
3	70	\$34.93	\$10.18	\$18.57	\$0.00	\$63.68
4	80	\$39.92	\$10.18	\$18.57	\$0.00	\$68.67
5	90	\$44.91	\$10.18	\$18.57	\$0.00	\$73.66

Notes:
Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES)	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1)	04/01/2015	\$37.64	\$9.80	\$16.21	\$0.00	\$63.65
MILLWRIGHTS LOCAL 1121 - Zone 1						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
----------------	----------------	-----------	--------	---------	------------------------------	------------

Apprentice - MILLWRIGHT - Local 1121 Zone 1

Effective Date - 04/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$20.70	\$9.80	\$4.48	\$0.00	\$34.98
2	65	\$24.47	\$9.80	\$13.36	\$0.00	\$47.63
3	75	\$28.23	\$9.80	\$14.18	\$0.00	\$52.21
4	85	\$31.99	\$9.80	\$14.99	\$0.00	\$56.78

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
LABORERS - ZONE 2	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75

For apprentice rates see "Apprentice- LABORER"

OILER (OTHER THAN TRUCK CRANES,GRADALLS)	06/01/2015	\$21.97	\$10.00	\$14.55	\$0.00	\$46.52
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$22.62	\$10.00	\$14.55	\$0.00	\$47.17
	06/01/2016	\$23.01	\$10.00	\$14.55	\$0.00	\$47.56
	12/01/2016	\$23.66	\$10.00	\$14.55	\$0.00	\$48.21
	06/01/2017	\$24.17	\$10.00	\$14.55	\$0.00	\$48.72
	12/01/2017	\$24.69	\$10.00	\$14.55	\$0.00	\$49.24

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OILER (TRUCK CRANES, GRADALLS)	06/01/2015	\$25.68	\$10.00	\$14.55	\$0.00	\$50.23
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$26.43	\$10.00	\$14.55	\$0.00	\$50.98
	06/01/2016	\$26.89	\$10.00	\$14.55	\$0.00	\$51.44
	12/01/2016	\$27.64	\$10.00	\$14.55	\$0.00	\$52.19
	06/01/2017	\$28.24	\$10.00	\$14.55	\$0.00	\$52.79
	12/01/2017	\$28.85	\$10.00	\$14.55	\$0.00	\$53.40

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OTHER POWER DRIVEN EQUIPMENT - CLASS II	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS)	07/01/2015	\$48.56	\$7.85	\$16.10	\$0.00	\$72.51
PAINTERS LOCAL 35 - ZONE 2	01/01/2016	\$49.51	\$7.85	\$16.10	\$0.00	\$73.46
	07/01/2016	\$50.46	\$7.85	\$16.10	\$0.00	\$74.41
	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36

Apprentice - PAINTER Local 35 - BRIDGES/TANKS**Effective Date - 07/01/2015**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.28	\$7.85	\$0.00	\$0.00	\$32.13
2	55	\$26.71	\$7.85	\$3.66	\$0.00	\$38.22
3	60	\$29.14	\$7.85	\$3.99	\$0.00	\$40.98
4	65	\$31.56	\$7.85	\$4.32	\$0.00	\$43.73
5	70	\$33.99	\$7.85	\$14.11	\$0.00	\$55.95
6	75	\$36.42	\$7.85	\$14.44	\$0.00	\$58.71
7	80	\$38.85	\$7.85	\$14.77	\$0.00	\$61.47
8	90	\$43.70	\$7.85	\$15.44	\$0.00	\$66.99

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.76	\$7.85	\$0.00	\$0.00	\$32.61
2	55	\$27.23	\$7.85	\$3.66	\$0.00	\$38.74
3	60	\$29.71	\$7.85	\$3.99	\$0.00	\$41.55
4	65	\$32.18	\$7.85	\$4.32	\$0.00	\$44.35
5	70	\$34.66	\$7.85	\$14.11	\$0.00	\$56.62
6	75	\$37.13	\$7.85	\$14.44	\$0.00	\$59.42
7	80	\$39.61	\$7.85	\$14.77	\$0.00	\$62.23
8	90	\$44.56	\$7.85	\$15.44	\$0.00	\$67.85

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *

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

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

07/01/2015	\$39.46	\$7.85	\$16.10	\$0.00	\$63.41
01/01/2016	\$40.41	\$7.85	\$16.10	\$0.00	\$64.36
07/01/2016	\$41.36	\$7.85	\$16.10	\$0.00	\$65.31
01/01/2017	\$42.31	\$7.85	\$16.10	\$0.00	\$66.26

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New**Effective Date - 07/01/2015**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.73	\$7.85	\$0.00	\$0.00	\$27.58
2	55	\$21.70	\$7.85	\$3.66	\$0.00	\$33.21
3	60	\$23.68	\$7.85	\$3.99	\$0.00	\$35.52
4	65	\$25.65	\$7.85	\$4.32	\$0.00	\$37.82
5	70	\$27.62	\$7.85	\$14.11	\$0.00	\$49.58
6	75	\$29.60	\$7.85	\$14.44	\$0.00	\$51.89
7	80	\$31.57	\$7.85	\$14.77	\$0.00	\$54.19
8	90	\$35.51	\$7.85	\$15.44	\$0.00	\$58.80

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.21	\$7.85	\$0.00	\$0.00	\$28.06
2	55	\$22.23	\$7.85	\$3.66	\$0.00	\$33.74
3	60	\$24.25	\$7.85	\$3.99	\$0.00	\$36.09
4	65	\$26.27	\$7.85	\$4.32	\$0.00	\$38.44
5	70	\$28.29	\$7.85	\$14.11	\$0.00	\$50.25
6	75	\$30.31	\$7.85	\$14.44	\$0.00	\$52.60
7	80	\$32.33	\$7.85	\$14.77	\$0.00	\$54.95
8	90	\$36.37	\$7.85	\$15.44	\$0.00	\$59.66

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2015	\$37.52	\$7.85	\$16.10	\$0.00	\$61.47
PAINTERS LOCAL 35 - ZONE 2	01/01/2016	\$38.47	\$7.85	\$16.10	\$0.00	\$62.42
	07/01/2016	\$39.42	\$7.85	\$16.10	\$0.00	\$63.37
	01/01/2017	\$40.37	\$7.85	\$16.10	\$0.00	\$64.32

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint
Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.76	\$7.85	\$0.00	\$0.00	\$26.61
2	55	\$20.64	\$7.85	\$3.66	\$0.00	\$32.15
3	60	\$22.51	\$7.85	\$3.99	\$0.00	\$34.35
4	65	\$24.39	\$7.85	\$4.32	\$0.00	\$36.56
5	70	\$26.26	\$7.85	\$14.11	\$0.00	\$48.22
6	75	\$28.14	\$7.85	\$14.44	\$0.00	\$50.43
7	80	\$30.02	\$7.85	\$14.77	\$0.00	\$52.64
8	90	\$33.77	\$7.85	\$15.44	\$0.00	\$57.06

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.24	\$7.85	\$0.00	\$0.00	\$27.09
2	55	\$21.16	\$7.85	\$3.66	\$0.00	\$32.67
3	60	\$23.08	\$7.85	\$3.99	\$0.00	\$34.92
4	65	\$25.01	\$7.85	\$4.32	\$0.00	\$37.18
5	70	\$26.93	\$7.85	\$14.11	\$0.00	\$48.89
6	75	\$28.85	\$7.85	\$14.44	\$0.00	\$51.14
7	80	\$30.78	\$7.85	\$14.77	\$0.00	\$53.40
8	90	\$34.62	\$7.85	\$15.44	\$0.00	\$57.91

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS)	06/01/2015	\$31.15	\$7.30	\$12.30	\$0.00	\$50.75
LABORERS - ZONE 2	12/01/2015	\$31.65	\$7.30	\$12.30	\$0.00	\$51.25
	06/01/2016	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
	12/01/2016	\$32.90	\$7.30	\$12.30	\$0.00	\$52.50

For Apprentice rates see "Apprentice- LABORER"

PAINTER / TAPER (BRUSH, NEW) *	07/01/2015	\$38.06	\$7.85	\$16.10	\$0.00	\$62.01
* If 30% or more of surfaces to be painted are new construction,	01/01/2016	\$39.01	\$7.85	\$16.10	\$0.00	\$62.96
NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	07/01/2016	\$39.96	\$7.85	\$16.10	\$0.00	\$63.91
	01/01/2017	\$40.91	\$7.85	\$16.10	\$0.00	\$64.86

Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**Effective Date - 07/01/2015**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.03	\$7.85	\$0.00	\$0.00	\$26.88
2	55	\$20.93	\$7.85	\$3.66	\$0.00	\$32.44
3	60	\$22.84	\$7.85	\$3.99	\$0.00	\$34.68
4	65	\$24.74	\$7.85	\$4.32	\$0.00	\$36.91
5	70	\$26.64	\$7.85	\$14.11	\$0.00	\$48.60
6	75	\$28.55	\$7.85	\$14.44	\$0.00	\$50.84
7	80	\$30.45	\$7.85	\$14.77	\$0.00	\$53.07
8	90	\$34.25	\$7.85	\$15.44	\$0.00	\$57.54

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.51	\$7.85	\$0.00	\$0.00	\$27.36
2	55	\$21.46	\$7.85	\$3.66	\$0.00	\$32.97
3	60	\$23.41	\$7.85	\$3.99	\$0.00	\$35.25
4	65	\$25.36	\$7.85	\$4.32	\$0.00	\$37.53
5	70	\$27.31	\$7.85	\$14.11	\$0.00	\$49.27
6	75	\$29.26	\$7.85	\$14.44	\$0.00	\$51.55
7	80	\$31.21	\$7.85	\$14.77	\$0.00	\$53.83
8	90	\$35.11	\$7.85	\$15.44	\$0.00	\$58.40

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)

PAINTERS LOCAL 35 - ZONE 2

07/01/2015	\$36.12	\$7.85	\$16.10	\$0.00	\$60.07
01/01/2016	\$37.07	\$7.85	\$16.10	\$0.00	\$61.02
07/01/2016	\$38.02	\$7.85	\$16.10	\$0.00	\$61.97
01/01/2017	\$38.97	\$7.85	\$16.10	\$0.00	\$62.92

Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT**Effective Date - 07/01/2015**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.06	\$7.85	\$0.00	\$0.00	\$25.91
2	55	\$19.87	\$7.85	\$3.66	\$0.00	\$31.38
3	60	\$21.67	\$7.85	\$3.99	\$0.00	\$33.51
4	65	\$23.48	\$7.85	\$4.32	\$0.00	\$35.65
5	70	\$25.28	\$7.85	\$14.11	\$0.00	\$47.24
6	75	\$27.09	\$7.85	\$14.44	\$0.00	\$49.38
7	80	\$28.90	\$7.85	\$14.77	\$0.00	\$51.52
8	90	\$32.51	\$7.85	\$15.44	\$0.00	\$55.80

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.54	\$7.85	\$0.00	\$0.00	\$26.39
2	55	\$20.39	\$7.85	\$3.66	\$0.00	\$31.90
3	60	\$22.24	\$7.85	\$3.99	\$0.00	\$34.08
4	65	\$24.10	\$7.85	\$4.32	\$0.00	\$36.27
5	70	\$25.95	\$7.85	\$14.11	\$0.00	\$47.91
6	75	\$27.80	\$7.85	\$14.44	\$0.00	\$50.09
7	80	\$29.66	\$7.85	\$14.77	\$0.00	\$52.28
8	90	\$33.36	\$7.85	\$15.44	\$0.00	\$56.65

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2012	\$30.28	\$9.07	\$8.00	\$0.00	\$47.35
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2014	\$41.60	\$9.80	\$18.17	\$0.00	\$69.57
	08/01/2015	\$43.10	\$9.80	\$18.17	\$0.00	\$71.07
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2014	\$41.60	\$9.80	\$18.17	\$0.00	\$69.57
	08/01/2015	\$43.10	\$9.80	\$18.17	\$0.00	\$71.07

Apprentice - PILE DRIVER - Local 56 Zone 1**Effective Date - 08/01/2014**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.80	\$9.80	\$18.17	\$0.00	\$48.77
2	60	\$24.96	\$9.80	\$18.17	\$0.00	\$52.93
3	70	\$29.12	\$9.80	\$18.17	\$0.00	\$57.09
4	75	\$31.20	\$9.80	\$18.17	\$0.00	\$59.17
5	80	\$33.28	\$9.80	\$18.17	\$0.00	\$61.25
6	80	\$33.28	\$9.80	\$18.17	\$0.00	\$61.25
7	90	\$37.44	\$9.80	\$18.17	\$0.00	\$65.41
8	90	\$37.44	\$9.80	\$18.17	\$0.00	\$65.41

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.55	\$9.80	\$18.17	\$0.00	\$49.52
2	60	\$25.86	\$9.80	\$18.17	\$0.00	\$53.83
3	70	\$30.17	\$9.80	\$18.17	\$0.00	\$58.14
4	75	\$32.33	\$9.80	\$18.17	\$0.00	\$60.30
5	80	\$34.48	\$9.80	\$18.17	\$0.00	\$62.45
6	80	\$34.48	\$9.80	\$18.17	\$0.00	\$62.45
7	90	\$38.79	\$9.80	\$18.17	\$0.00	\$66.76
8	90	\$38.79	\$9.80	\$18.17	\$0.00	\$66.76

Notes:**Apprentice to Journeyworker Ratio:1:3**

PIPEFITTER & STEAMFITTER

PIPEFITTERS LOCAL 537 (Local 138)

03/01/2015	\$46.36	\$9.70	\$14.89	\$0.00	\$70.95
09/01/2015	\$47.36	\$9.70	\$14.89	\$0.00	\$71.95
03/01/2016	\$48.36	\$9.70	\$14.89	\$0.00	\$72.95
09/01/2016	\$49.36	\$9.70	\$14.89	\$0.00	\$73.95
03/01/2017	\$50.36	\$9.70	\$14.89	\$0.00	\$74.95

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - PIPEFITTER Local 537 (Local 138)
Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.54	\$9.70	\$5.50	\$0.00	\$33.74
2	45	\$20.86	\$9.70	\$14.89	\$0.00	\$45.45
3	60	\$27.82	\$9.70	\$14.89	\$0.00	\$52.41
4	70	\$32.45	\$9.70	\$14.89	\$0.00	\$57.04
5	80	\$37.09	\$9.70	\$14.89	\$0.00	\$61.68

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.94	\$9.70	\$5.50	\$0.00	\$34.14
2	45	\$21.31	\$9.70	\$14.89	\$0.00	\$45.90
3	60	\$28.42	\$9.70	\$14.89	\$0.00	\$53.01
4	70	\$33.15	\$9.70	\$14.89	\$0.00	\$57.74
5	80	\$37.89	\$9.70	\$14.89	\$0.00	\$62.48

Notes:

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

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

Apprentice to Journeyworker Ratio:**

PIPELAYER	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
LABORERS - ZONE 2	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
PLUMBER	03/01/2015	\$46.13	\$10.32	\$14.89	\$0.00	\$71.34
PLUMBERS & GASFITTERS LOCAL 12 (Local 138)	09/01/2015	\$47.13	\$10.32	\$14.89	\$0.00	\$72.34
	03/01/2016	\$48.28	\$10.32	\$14.89	\$0.00	\$73.49
	09/01/2016	\$49.33	\$10.32	\$14.89	\$0.00	\$74.54
	03/01/2017	\$50.33	\$10.32	\$14.89	\$0.00	\$75.54

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
----------------	----------------	-----------	--------	---------	------------------------------	------------

Apprentice - PLUMBER/GASFITTER - Local 12 (Local 138)

Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$16.15	\$10.32	\$5.54	\$0.00	\$32.01
2	40	\$18.45	\$10.32	\$6.27	\$0.00	\$35.04
3	55	\$25.37	\$10.32	\$8.42	\$0.00	\$44.11
4	65	\$29.98	\$10.32	\$9.87	\$0.00	\$50.17
5	75	\$34.60	\$10.32	\$11.30	\$0.00	\$56.22

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$16.50	\$10.32	\$5.54	\$0.00	\$32.36
2	40	\$18.85	\$10.32	\$6.27	\$0.00	\$35.44
3	55	\$25.92	\$10.32	\$8.42	\$0.00	\$44.66
4	65	\$30.63	\$10.32	\$9.87	\$0.00	\$50.82
5	75	\$35.35	\$10.32	\$11.30	\$0.00	\$56.97

Notes:

Steps are 1 yr
Step 4 with lic\$53.20 Step5 with lic\$59.23

Apprentice to Journeyworker Ratio:1:5

PNEUMATIC CONTROLS (TEMP.)	03/01/2015	\$46.36	\$9.70	\$14.89	\$0.00	\$70.95
PIPEFITTERS LOCAL 537 (Local 138)	09/01/2015	\$47.36	\$9.70	\$14.89	\$0.00	\$71.95
	03/01/2016	\$48.36	\$9.70	\$14.89	\$0.00	\$72.95
	09/01/2016	\$49.36	\$9.70	\$14.89	\$0.00	\$73.95
	03/01/2017	\$50.36	\$9.70	\$14.89	\$0.00	\$74.95

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

PNEUMATIC DRILL/TOOL OPERATOR	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
LABORERS - ZONE 2	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75

For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER	06/01/2015	\$32.15	\$7.30	\$12.30	\$0.00	\$51.75
LABORERS - ZONE 2	12/01/2015	\$32.65	\$7.30	\$12.30	\$0.00	\$52.25
	06/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
	12/01/2016	\$33.90	\$7.30	\$12.30	\$0.00	\$53.50

For apprentice rates see "Apprentice- LABORER"

POWER SHOVEL/DERRICK/TRENCHING MACHINE	06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
	06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
	12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
	06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
	12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
	06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
	12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
	06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$29.61	\$10.00	\$14.55	\$0.00	\$54.16
	12/01/2015	\$30.48	\$10.00	\$14.55	\$0.00	\$55.03
	06/01/2016	\$31.00	\$10.00	\$14.55	\$0.00	\$55.55
	12/01/2016	\$31.87	\$10.00	\$14.55	\$0.00	\$56.42
	06/01/2017	\$32.56	\$10.00	\$14.55	\$0.00	\$57.11
	12/01/2017	\$33.25	\$10.00	\$14.55	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS LOCAL 42</i>	05/01/2015	\$22.66	\$8.49	\$9.89	\$0.00	\$41.04
	11/01/2015	\$22.78	\$8.49	\$9.89	\$0.00	\$41.16
	04/30/2016	\$22.78	\$8.49	\$10.25	\$0.00	\$41.52
	05/01/2016	\$24.15	\$8.49	\$10.68	\$0.00	\$43.32
	04/30/2017	\$24.15	\$8.49	\$11.07	\$0.00	\$43.71
	05/01/2017	\$24.21	\$8.49	\$11.54	\$0.00	\$44.24
	04/30/2018	\$24.21	\$8.49	\$11.96	\$0.00	\$44.66
	05/01/2018	\$24.24	\$8.49	\$12.46	\$0.00	\$45.19
	04/30/2019	\$24.24	\$8.49	\$12.92	\$0.00	\$45.65
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) <i>CARPENTERS -ZONE 2 (Residential Wood)</i>	04/01/2011	\$24.24	\$8.67	\$15.51	\$0.00	\$48.42
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. <i>CARPENTERS -ZONE 2 (Residential Wood)</i> As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.	05/01/2011	\$24.24	\$6.34	\$6.23	\$0.00	\$36.81

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - CARPENTER (Residential Wood Frame) - Zone 2
Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$14.54	\$6.34	\$0.00	\$0.00	\$20.88
2	60	\$14.54	\$6.34	\$6.23	\$0.00	\$27.11
3	65	\$15.76	\$6.34	\$6.23	\$0.00	\$28.33
4	70	\$16.97	\$6.34	\$6.23	\$0.00	\$29.54
5	75	\$18.18	\$6.34	\$6.23	\$0.00	\$30.75
6	80	\$19.39	\$6.34	\$6.23	\$0.00	\$31.96
7	85	\$20.60	\$6.34	\$6.23	\$0.00	\$33.17
8	90	\$21.82	\$6.34	\$6.23	\$0.00	\$34.39

Notes:
Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
LABORERS - ZONE 2	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75

For apprentice rates see "Apprentice- LABORER"

ROLLER/SPREADER/MULCHING MACHINE	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
OPERATING ENGINEERS LOCAL 4	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

ROOFER (Inc.Roofing Waterproofing &Roofing Dampproofing)	02/01/2015	\$40.11	\$10.50	\$11.60	\$0.00	\$62.21
ROOFERS LOCAL 33	08/01/2015	\$41.01	\$10.50	\$11.60	\$0.00	\$63.11
	02/01/2016	\$41.91	\$10.50	\$11.60	\$0.00	\$64.01

Classification

Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate

Apprentice - ROOFER - Local 33
Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.06	\$10.50	\$3.38	\$0.00	\$33.94
2	60	\$24.07	\$10.50	\$11.60	\$0.00	\$46.17
3	65	\$26.07	\$10.50	\$11.60	\$0.00	\$48.17
4	75	\$30.08	\$10.50	\$11.60	\$0.00	\$52.18
5	85	\$34.09	\$10.50	\$11.60	\$0.00	\$56.19

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.51	\$10.50	\$3.38	\$0.00	\$34.39
2	60	\$24.61	\$10.50	\$11.60	\$0.00	\$46.71
3	65	\$26.66	\$10.50	\$11.60	\$0.00	\$48.76
4	75	\$30.76	\$10.50	\$11.60	\$0.00	\$52.86
5	85	\$34.86	\$10.50	\$11.60	\$0.00	\$56.96

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE	02/01/2015	\$40.36	\$10.50	\$11.60	\$0.00	\$62.46
ROOFERS LOCAL 33	08/01/2015	\$41.26	\$10.50	\$11.60	\$0.00	\$63.36
	02/01/2016	\$42.16	\$10.50	\$11.60	\$0.00	\$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER	02/01/2015	\$43.28	\$10.20	\$20.54	\$2.22	\$76.24
SHEETMETAL WORKERS LOCAL 17 - A	08/01/2015	\$43.31	\$10.20	\$21.48	\$2.25	\$77.24
	02/01/2016	\$44.31	\$10.20	\$21.48	\$2.25	\$78.24
	08/01/2016	\$45.46	\$10.20	\$21.48	\$2.25	\$79.39
	02/01/2017	\$46.56	\$10.20	\$21.48	\$2.25	\$80.49
	08/01/2017	\$47.66	\$10.20	\$21.48	\$2.25	\$81.59
	02/01/2018	\$48.81	\$10.20	\$21.48	\$2.25	\$82.74

Classification

Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate

Apprentice - SHEET METAL WORKER - Local 17-A
Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.31	\$10.20	\$4.58	\$0.00	\$32.09
2	40	\$17.31	\$10.20	\$4.58	\$0.00	\$32.09
3	45	\$19.48	\$10.20	\$9.09	\$1.16	\$39.93
4	45	\$19.48	\$10.20	\$9.09	\$1.16	\$39.93
5	50	\$21.64	\$10.20	\$9.91	\$1.25	\$43.00
6	50	\$21.64	\$10.20	\$10.16	\$1.26	\$43.26
7	60	\$25.97	\$10.20	\$11.55	\$1.43	\$49.15
8	65	\$28.13	\$10.20	\$12.38	\$1.52	\$52.23
9	75	\$32.46	\$10.20	\$14.02	\$1.70	\$58.38
10	85	\$36.79	\$10.20	\$15.16	\$1.86	\$64.01

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.32	\$10.20	\$4.90	\$0.00	\$32.42
2	40	\$17.32	\$10.20	\$4.90	\$0.00	\$32.42
3	45	\$19.49	\$10.20	\$9.59	\$1.18	\$40.46
4	45	\$19.49	\$10.20	\$9.59	\$1.18	\$40.46
5	50	\$21.66	\$10.20	\$10.45	\$1.27	\$43.58
6	50	\$21.66	\$10.20	\$10.70	\$1.28	\$43.84
7	60	\$25.99	\$10.20	\$12.17	\$1.45	\$49.81
8	65	\$28.15	\$10.20	\$13.04	\$1.54	\$52.93
9	75	\$32.48	\$10.20	\$14.76	\$1.72	\$59.16
10	85	\$36.81	\$10.20	\$15.98	\$1.89	\$64.88

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR	06/01/2013	\$25.81	\$7.07	\$7.05	\$0.00	\$39.93
PAINTERS LOCAL 35 - ZONE 2						

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - SIGN ERECTOR - Local 35 Zone 2
Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$12.91	\$7.07	\$0.00	\$0.00	\$19.98
2	55	\$14.20	\$7.07	\$2.45	\$0.00	\$23.72
3	60	\$15.49	\$7.07	\$2.45	\$0.00	\$25.01
4	65	\$16.78	\$7.07	\$2.45	\$0.00	\$26.30
5	70	\$18.07	\$7.07	\$7.05	\$0.00	\$32.19
6	75	\$19.36	\$7.07	\$7.05	\$0.00	\$33.48
7	80	\$20.65	\$7.07	\$7.05	\$0.00	\$34.77
8	85	\$21.94	\$7.07	\$7.05	\$0.00	\$36.06
9	90	\$23.23	\$7.07	\$7.05	\$0.00	\$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1
SPECIALIZED EARTH MOVING EQUIP < 35 TONS
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

06/01/2015	\$31.94	\$9.91	\$9.33	\$0.00	\$51.18
08/01/2015	\$31.94	\$10.41	\$9.33	\$0.00	\$51.68
12/01/2015	\$31.94	\$10.41	\$10.08	\$0.00	\$52.43
06/01/2016	\$32.44	\$10.41	\$10.08	\$0.00	\$52.93
08/01/2016	\$32.44	\$10.91	\$10.08	\$0.00	\$53.43
12/01/2016	\$32.44	\$10.91	\$10.89	\$0.00	\$54.24

SPECIALIZED EARTH MOVING EQUIP > 35 TONS
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

06/01/2015	\$32.23	\$9.91	\$9.33	\$0.00	\$51.47
08/01/2015	\$32.23	\$10.41	\$9.33	\$0.00	\$51.97
12/01/2015	\$32.23	\$10.41	\$10.08	\$0.00	\$52.72
06/01/2016	\$32.73	\$10.41	\$10.08	\$0.00	\$53.22
08/01/2016	\$32.73	\$10.91	\$10.08	\$0.00	\$53.72
12/01/2016	\$32.73	\$10.91	\$10.89	\$0.00	\$54.53

SPRINKLER FITTER
SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2

03/01/2015	\$48.99	\$8.42	\$14.90	\$0.00	\$72.31
10/01/2015	\$50.03	\$8.42	\$14.90	\$0.00	\$73.35
01/01/2016	\$50.03	\$8.67	\$15.05	\$0.00	\$73.75
03/01/2016	\$50.93	\$8.67	\$15.05	\$0.00	\$74.65
10/01/2016	\$51.97	\$8.67	\$15.05	\$0.00	\$75.69
03/01/2017	\$52.87	\$8.67	\$15.05	\$0.00	\$76.59

Classification

Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate

Apprentice - SPRINKLER FITTER - Local 550 (Section B) Zone 2
Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$17.15	\$8.42	\$8.40	\$0.00	\$33.97
2	40	\$19.60	\$8.42	\$8.40	\$0.00	\$36.42
3	45	\$22.05	\$8.42	\$8.40	\$0.00	\$38.87
4	50	\$24.50	\$8.42	\$8.40	\$0.00	\$41.32
5	55	\$26.94	\$8.42	\$8.40	\$0.00	\$43.76
6	60	\$29.39	\$8.42	\$8.40	\$0.00	\$46.21
7	65	\$31.84	\$8.42	\$8.40	\$0.00	\$48.66
8	70	\$34.29	\$8.42	\$8.40	\$0.00	\$51.11
9	75	\$36.74	\$8.42	\$8.40	\$0.00	\$53.56
10	80	\$39.19	\$8.42	\$8.40	\$0.00	\$56.01

Effective Date - 10/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$17.51	\$8.42	\$8.40	\$0.00	\$34.33
2	40	\$20.01	\$8.42	\$8.40	\$0.00	\$36.83
3	45	\$22.51	\$8.42	\$8.40	\$0.00	\$39.33
4	50	\$25.02	\$8.42	\$8.40	\$0.00	\$41.84
5	55	\$27.52	\$8.42	\$8.40	\$0.00	\$44.34
6	60	\$30.02	\$8.42	\$8.40	\$0.00	\$46.84
7	65	\$32.52	\$8.42	\$8.40	\$0.00	\$49.34
8	70	\$35.02	\$8.42	\$8.40	\$0.00	\$51.84
9	75	\$37.52	\$8.42	\$8.40	\$0.00	\$54.34
10	80	\$40.02	\$8.42	\$8.40	\$0.00	\$56.84

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

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN OPERATING ENGINEERS LOCAL 4	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN	03/01/2015	\$33.88	\$13.00	\$13.70	\$0.00	\$60.58
<i>ELECTRICIANS LOCAL 103</i>	09/01/2015	\$34.60	\$13.00	\$13.72	\$0.00	\$61.32
	03/01/2016	\$35.31	\$13.00	\$13.74	\$0.00	\$62.05

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$13.55	\$13.00	\$0.41	\$0.00	\$26.96
2	40	\$13.55	\$13.00	\$0.41	\$0.00	\$26.96
3	45	\$15.25	\$13.00	\$10.87	\$0.00	\$39.12
4	45	\$15.25	\$13.00	\$10.87	\$0.00	\$39.12
5	50	\$16.94	\$13.00	\$11.11	\$0.00	\$41.05
6	55	\$18.63	\$13.00	\$11.38	\$0.00	\$43.01
7	60	\$20.33	\$13.00	\$11.64	\$0.00	\$44.97
8	65	\$22.02	\$13.00	\$11.89	\$0.00	\$46.91
9	70	\$23.72	\$13.00	\$12.15	\$0.00	\$48.87
10	75	\$25.41	\$13.00	\$12.41	\$0.00	\$50.82

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$13.84	\$13.00	\$0.42	\$0.00	\$27.26
2	40	\$13.84	\$13.00	\$0.42	\$0.00	\$27.26
3	45	\$15.57	\$13.00	\$10.88	\$0.00	\$39.45
4	45	\$15.57	\$13.00	\$10.88	\$0.00	\$39.45
5	50	\$17.30	\$13.00	\$11.14	\$0.00	\$41.44
6	55	\$19.03	\$13.00	\$11.39	\$0.00	\$43.42
7	60	\$20.76	\$13.00	\$11.65	\$0.00	\$45.41
8	65	\$22.49	\$13.00	\$11.90	\$0.00	\$47.39
9	70	\$24.22	\$13.00	\$12.17	\$0.00	\$49.39
10	75	\$25.95	\$13.00	\$12.43	\$0.00	\$51.38

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	02/01/2015	\$47.90	\$10.18	\$18.50	\$0.00	\$76.58
<i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2015	\$48.80	\$10.18	\$18.57	\$0.00	\$77.55
	02/01/2016	\$49.37	\$10.18	\$18.57	\$0.00	\$78.12
	08/01/2016	\$50.27	\$10.18	\$18.65	\$0.00	\$79.10
	02/01/2017	\$50.84	\$10.18	\$18.65	\$0.00	\$79.67

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile
Effective Date - 02/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.95	\$10.18	\$18.50	\$0.00	\$52.63
2	60	\$28.74	\$10.18	\$18.50	\$0.00	\$57.42
3	70	\$33.53	\$10.18	\$18.50	\$0.00	\$62.21
4	80	\$38.32	\$10.18	\$18.50	\$0.00	\$67.00
5	90	\$43.11	\$10.18	\$18.50	\$0.00	\$71.79

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.40	\$10.18	\$18.57	\$0.00	\$53.15
2	60	\$29.28	\$10.18	\$18.57	\$0.00	\$58.03
3	70	\$34.16	\$10.18	\$18.57	\$0.00	\$62.91
4	80	\$39.04	\$10.18	\$18.57	\$0.00	\$67.79
5	90	\$43.92	\$10.18	\$18.57	\$0.00	\$72.67

Notes:
Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2015	\$36.45	\$7.30	\$13.40	\$0.00	\$57.15
	12/01/2015	\$37.20	\$7.30	\$13.40	\$0.00	\$57.90
	06/01/2016	\$37.95	\$7.30	\$13.40	\$0.00	\$58.65
	12/01/2016	\$38.95	\$7.30	\$13.40	\$0.00	\$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2015	\$35.17	\$7.30	\$13.40	\$0.00	\$55.87
	12/01/2015	\$35.92	\$7.30	\$13.40	\$0.00	\$56.62
	06/01/2016	\$36.67	\$7.30	\$13.40	\$0.00	\$57.37
	12/01/2016	\$37.67	\$7.30	\$13.40	\$0.00	\$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2015	\$35.05	\$7.30	\$13.40	\$0.00	\$55.75
	12/01/2015	\$35.80	\$7.30	\$13.40	\$0.00	\$56.50
	06/01/2016	\$36.55	\$7.30	\$13.40	\$0.00	\$57.25
	12/01/2016	\$37.55	\$7.30	\$13.40	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$42.42	\$10.00	\$14.55	\$0.00	\$66.97
	12/01/2015	\$43.66	\$10.00	\$14.55	\$0.00	\$68.21
	06/01/2016	\$44.41	\$10.00	\$14.55	\$0.00	\$68.96
	12/01/2016	\$45.64	\$10.00	\$14.55	\$0.00	\$70.19
	06/01/2017	\$46.63	\$10.00	\$14.55	\$0.00	\$71.18
	12/01/2017	\$47.62	\$10.00	\$14.55	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2015	\$32.52	\$9.91	\$9.33	\$0.00	\$51.76
	08/01/2015	\$32.52	\$10.41	\$9.33	\$0.00	\$52.26
	12/01/2015	\$32.52	\$10.41	\$10.08	\$0.00	\$53.01
	06/01/2016	\$33.02	\$10.41	\$10.08	\$0.00	\$53.51
	08/01/2016	\$33.02	\$10.91	\$10.08	\$0.00	\$54.01
	12/01/2016	\$33.02	\$10.91	\$10.89	\$0.00	\$54.82
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	06/01/2015	\$47.33	\$7.30	\$13.80	\$0.00	\$68.43
	12/01/2015	\$48.08	\$7.30	\$13.80	\$0.00	\$69.18
	06/01/2016	\$48.83	\$7.30	\$13.80	\$0.00	\$69.93
	12/01/2016	\$49.83	\$7.30	\$13.80	\$0.00	\$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	06/01/2015	\$49.33	\$7.30	\$13.80	\$0.00	\$70.43
	12/01/2015	\$50.08	\$7.30	\$13.80	\$0.00	\$71.18
	06/01/2016	\$50.83	\$7.30	\$13.80	\$0.00	\$71.93
	12/01/2016	\$51.83	\$7.30	\$13.80	\$0.00	\$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2015	\$39.40	\$7.30	\$13.80	\$0.00	\$60.50
	12/01/2015	\$40.15	\$7.30	\$13.80	\$0.00	\$61.25
	06/01/2016	\$40.90	\$7.30	\$13.80	\$0.00	\$62.00
	12/01/2016	\$41.90	\$7.30	\$13.80	\$0.00	\$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2015	\$41.40	\$7.30	\$13.80	\$0.00	\$62.50
	12/01/2015	\$42.15	\$7.30	\$13.80	\$0.00	\$63.25
	06/01/2016	\$42.90	\$7.30	\$13.80	\$0.00	\$64.00
	12/01/2016	\$43.90	\$7.30	\$13.80	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2015	\$31.94	\$9.91	\$9.33	\$0.00	\$51.18
	08/01/2015	\$31.94	\$10.41	\$9.33	\$0.00	\$51.68
	12/01/2015	\$31.94	\$10.41	\$10.08	\$0.00	\$52.43
	06/01/2016	\$32.44	\$10.41	\$10.08	\$0.00	\$52.93
	08/01/2016	\$32.44	\$10.91	\$10.08	\$0.00	\$53.43
	12/01/2016	\$32.44	\$10.91	\$10.89	\$0.00	\$54.24
WAGON DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2015	\$31.40	\$7.30	\$12.30	\$0.00	\$51.00
	12/01/2015	\$31.90	\$7.30	\$12.30	\$0.00	\$51.50
	06/01/2016	\$32.40	\$7.30	\$12.30	\$0.00	\$52.00
	12/01/2016	\$33.15	\$7.30	\$12.30	\$0.00	\$52.75
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2015	\$42.83	\$10.00	\$14.55	\$0.00	\$67.38
	12/01/2015	\$44.08	\$10.00	\$14.55	\$0.00	\$68.63
	06/01/2016	\$44.83	\$10.00	\$14.55	\$0.00	\$69.38
	12/01/2016	\$46.08	\$10.00	\$14.55	\$0.00	\$70.63
	06/01/2017	\$47.08	\$10.00	\$14.55	\$0.00	\$71.63
	12/01/2017	\$48.08	\$10.00	\$14.55	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>	03/01/2015	\$46.13	\$10.32	\$14.89	\$0.00	\$71.34
	09/01/2015	\$47.13	\$10.32	\$14.89	\$0.00	\$72.34
	03/01/2016	\$48.28	\$10.32	\$14.89	\$0.00	\$73.49
	09/01/2016	\$49.33	\$10.32	\$14.89	\$0.00	\$74.54
	03/01/2017	\$50.33	\$10.32	\$14.89	\$0.00	\$75.54
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$25.66	\$8.70	\$4.48	\$0.00	\$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$36.55	\$8.70	\$6.58	\$0.00	\$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$29.94	\$8.70	\$6.05	\$0.00	\$44.69
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$23.52	\$8.70	\$5.24	\$0.00	\$37.46
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$36.35	\$8.70	\$9.43	\$0.00	\$54.48
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$32.08	\$8.70	\$6.59	\$0.00	\$47.37
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$23.52	\$8.70	\$3.72	\$0.00	\$35.94
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$19.25	\$8.70	\$2.85	\$0.00	\$30.80
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$42.77	\$8.70	\$11.78	\$0.00	\$63.25

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$25.66	\$8.70	\$4.24	\$0.00	\$38.60
2	65	\$27.80	\$8.70	\$4.71	\$0.00	\$41.21
3	70	\$29.94	\$8.70	\$5.43	\$0.00	\$44.07
4	75	\$32.08	\$8.70	\$6.16	\$0.00	\$46.94
5	80	\$34.22	\$8.70	\$6.88	\$0.00	\$49.80
6	85	\$36.35	\$8.70	\$7.62	\$0.00	\$52.67
7	90	\$38.49	\$8.70	\$8.83	\$0.00	\$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2015	\$28.12	\$4.25	\$3.09	\$0.00	\$35.46
	01/01/2016	\$28.98	\$4.25	\$3.12	\$0.00	\$36.35
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2015	\$26.49	\$4.25	\$3.04	\$0.00	\$33.78
	01/01/2016	\$27.31	\$4.25	\$3.07	\$0.00	\$34.63
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2015	\$26.49	\$4.25	\$3.04	\$0.00	\$33.78
	01/01/2016	\$27.31	\$4.25	\$3.07	\$0.00	\$34.63
TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/01/2015	\$18.05	\$3.55	\$0.00	\$0.00	\$21.60
	01/31/2016	\$18.51	\$3.55	\$0.00	\$0.00	\$22.06
This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.						
TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/01/2015	\$15.92	\$3.55	\$0.00	\$0.00	\$19.47
	01/31/2016	\$16.32	\$3.55	\$0.00	\$0.00	\$19.87
This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.						

Additional Apprentices Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

SECTION 01010

SUMMARY OF WORK

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 LOCATION OF WORK

- A. The work of this Contract is located in the City of Salem within and adjacent to Washington Street and Dodge Street.

1.3 SUMMARY

- A. Furnish all labor, materials, equipment, and incidentals required to perform the work associated with the WASHINGTON STREET AND DODGE STREET UTILITY REPLACEMENT PROJECT as indicated on the Drawings and Attachments and specified herein.
- B. The Work includes, but is not necessarily limited to, the following major items:
 - 1. Demolition of existing project area including removal of trees and stumps, street lights, pedestrian lights, light footings and conduits, sprinklers, curbing, sidewalk, paving, traffic island(s), and line striping.
 - 2. Installation of approximately 300 linear feet of new 24-inch, 36-inch, and 42-inch polypropylene sewer pipe and manholes, including 8-inch and 12-inch sewer service stubs as indicated.
 - 3. Modification and abandonment of existing sewer structures and pipe including a sewer sluice gate structure.
 - 4. Rehabilitation and reconstruction of sewer and drain structures.
 - 5. Installation of approximately 400 linear feet of new 12-inch and 18-inch drain pipe and structures.
 - 6. Installation of approximately 950 linear feet of new electric conduits with concrete encasement and a new electric manhole, materials to be provided by National Grid.
 - 7. Excavation for installation of approximately 700 linear feet of new high and low pressure gas pipes, materials and labor for installation to be

provided by National Grid.

8. Installation of approximately 500 linear feet of new 12-inch ductile iron water pipe, valves, and hydrants; as well as 6-inch, 4-inch, and 1-inch services with a water meter box.
 9. Installation of linestops or insertion valves if required to facilitate gate valve installation and service shutdowns if required.
 10. Bypass pumping of sewer and drainage flows to facilitate work, construction dewatering and discharge of treated dewatering.
 11. Traffic and pedestrian management including signage, line striping, barriers, fencing, and variable message boards if required.
 12. All incidental work shown on the plans and relating to the above items of work but not listed separately.
 13. The project also includes temporary and permanent paving of utility trenches and test pit excavations, as well as reconstruction and paving of portions of parking lot, sidewalks, and ADA ramps; and reconstruction and replanting of traffic island.
- C. 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.
- D. Work and materials which are necessary in the construction but which are not specifically referred to in the Specification, 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, operational and finished project whether shown in every detail or not.

1.4 WORK BY OTHERS

- A. Contractor shall be aware that property owner of the adjacent property on Dodge Street and Dodge Street Court (RCG, LLC) plans to demolish the buildings during the contract period. Demolition will take place primarily from the Dodge Street Court side of the property but will require access from Dodge Street and Dodge Street Court for equipment and trucking. Contractor is responsible to coordinate work with property owner and their contractor(s) to maintain access to and from demolition project site, including provisions to bury and/or protect bypass piping along Dodge Street.
- B. The property owner of the adjacent property on Dodge Street and Dodge Street Court (RCG, LLC) plans to construct a commercial and residential complex on the

adjacent property on Dodge Street and Dodge Street Court that will extend on to the existing parking lot within the project area. The redevelopment complex will include removal of the pavement in the parking lot and removal and reconstruction of the sidewalks along Washington Street adjacent to the project area. Contractor is required to restore the project area and staging area as shown on the plans to provide safe vehicular and pedestrian parking and traffic for the time period between the end of the utility relocation project and construction of the redevelopment project by others (estimated at one to two years).

- C. National Grid plans to de-energize the 115 kV high voltage direct bury cables that pass through the construction site by March of 2016 and begin removal of the cables in March of 2016. Contractor is responsible to coordinate work with National Grid (electric transmission representatives) and their contractor(s) to provide access to the site to remove their utilities during the construction period.
- D. National Grid plans to relocate the electric distribution cables that pass through the site during or after the construction period. Contractor is responsible to relocate the electric distribution conduits and manholes as shown on the plans and as directed by National Grid (electric distribution representatives) including concrete encasement, backfill, paving, etc.. National Grid will provide and deliver the materials for the new electric distribution conduits and manholes, Contractor is responsible to install the new electric distribution facilities, and coordinate with National Grid (electric distribution representatives) for timing and sequence of material delivery. Contractor responsible for unloading, storing, and protecting materials onsite prior to installation. Contractor is responsible to coordinate work with National Grid and their contractor(s) to provide access to the site to complete installation of the conduits, modify existing manhole structures, and pull wires during the construction period.
- E. National Grid plans to relocate the high and low pressure gas lines that pass through the site during or after the construction period. Contractor is responsible to excavate trenches for installation of new gas pipes by National Grid contractor(s) during the contract period as shown on the plans and as directed by National Grid (gas representatives) including backfill, paving, etc.. National Grid will provide and deliver the materials for the new gas piping, Contractor is responsible to excavate trenches for new gas facilities, and coordinate with National Grid (gas representatives) for timing and sequence of material delivery and installation contractor. Contractor responsible for unloading, storing, and protecting materials onsite prior to installation. Contractor is responsible to coordinate work with National Grid and their contractor(s) to provide access to the site to complete installation of the pipes, including connecting to existing pipes, taps, and abandonment and purging of existing pipes during the construction period.
- F. National Grid plans to relocate the gas line on Dodge Street and Dodge Street Court before or during the construction period. Contractor is responsible to coordinate work with National Grid and their contractor(s) to provide access to the site to complete installation of the pipes, including connecting to existing pipes, taps, and abandonment and purging of existing pipes during the construction period.
- G. Verizon plans to relocate existing conduits, wires, and manholes that pass through the site after the construction period. The number, location, and configuration of the proposed conduits and manholes have not yet been determined. Contractor is responsible to coordinate work with Verizon and their contractor(s) to provide access

to the site to complete investigations and inventory of existing facilities during the construction period.

- H. MassDOT is currently designing a roadway reconstruction project for Canal Street from Mill/Washington intersection to the Loring/Jefferson intersection, including the intersection of Mill Street and Washington Street adjacent to the Washington Street and Dodge Street Utility Replacement Project project area. The work will include roadway, sidewalk, and curb reconstruction as well as new drainage infrastructure, signage, and traffic/pedestrian signals (including the traffic and pedestrian signals located within the project area at the Mill Street and Washington Street intersection. Construction on the project is expected to begin in the Spring of 2016 and be completed within 18 months. Contractor is required to protect, support, and maintain or remove and replace traffic/pedestrian signals as shown on the plans, and support restore the project area and staging area as shown on the plans to provide safe vehicular and pedestrian parking and traffic for the time period between the end of the utility relocation project and reconstruction of the Mill/Washington/Canal intersection by others (estimated at one to two years).

- B. Refer to Article 7 of the General Conditions for additional requirements.

1.5 WORK SEQUENCE:

- A. Contractor shall be aware that existing 115 kV high voltage, direct bury cables pass through the project area and a cable splice joint structure exists within the project area. Contractor is required to coordinate with National Grid (electric transmission representatives) when working near the cables or splice joint structure. Contractor is required to contact National Grid for specific requirements but assume that any work completed within 10-feet of the cables requires coordination and permission from National Grid. The cables were installed with a concrete slab and/or steel plate above the cables for protection, any work under the cables will require excavation to the concrete slab or steel plates, coordination with NGrid and removal of concrete slab or steel plates by NGrid contractor or under their direction and observation, support and protection of the cables during construction and backfill and replacement of concrete slabs or steel plates under NGrid direction and observation.
- B. National Grid plans to temporarily de-energize the 115 kV high voltage direct bury cables that pass through the construction site for approximately one week in September of 2015, currently planned for September 14 through September 19, 2015.
- C. National Grid plans to permanently de-energize the 115 kV high voltage direct bury cables that pass through the construction site by March of 2016 and begin removal of the cables in March of 2016. Contractor is responsible to coordinate work with National Grid (electric transmission representatives) and their contractor(s) to provide access to the site to remove their utilities during the construction period.
- D. No temporary water main bypass will be permitted after November 15, 2015 without authorization from the City of Salem.
- E. Prior to installation of temporary water bypass if required, Contractor to work with City to exercise valves, isolate work area to be served by the bypass, and identify all

buildings affected by proposed bypass. Contractor to install temporary water bypass to serve all affected fire hydrants and properties before beginning other work including connections to all fire and domestic services to each affected building.

- F. With the exception of brief water service interruptions of the existing water mains on Dodge Street, in the parking lot at Dodge/Washington, and on Washington at the Canal Street intersection (to install new isolation valves on existing mains), no water service interruptions will be permitted within the project area until the new water mains have been installed, disinfected, and passed bacteria and pressure testing; allowing for a single, brief service interruption for each new and existing service connection and fire hydrant. No additional service interruptions will be permitted until all service connections and fire hydrants are brought back into service.
- G. Prior to any excavation activity, including test pits, the Contractor shall furnish and install sedimentation and erosion control measures including filter fabric and silt sacks in all catch basins, a silt sock or straw wattle barrier around all soil stockpiles, an erosion and sedimentation barrier along resource area boundaries, and designate a location for a sedimentation tank in areas where high groundwater or tidal and wet-weather dewatering is anticipated. The Contractors shall submit a Work Sequencing Plan to the Engineer for review prior to beginning any construction activity, unless otherwise approved by the Engineer.
- G. Contractor to schedule construction activities to allow Verizon and National Grid and other utilities to access their respective facilities and complete their respective work within the project area during the contract time.
- H. Contractor to schedule new water main installations and adjust layout of new water mains in the field to avoid conflicts with existing and proposed drains and other existing utilities. New water work to be completed following drain and sewer work unless directed otherwise by the Engineer.
- I. Contractor to schedule new drain and sewer installation to avoid any interruption of water service and adjust layout of new drains and sewers in the field to avoid conflicts with existing and proposed water mains and other existing utilities.
- J. Contractor shall schedule construction activities to account for variable flows in pipes due to weather and tidal conditions as well as high and variable groundwater levels due to seasonal variation, weather events, and tidal impacts.
- K. Contractor shall be aware that all pipes may convey both sanitary flows and stormwater flows and may also receive saline inflows during higher tide conditions.
- L. The Contractors shall submit a Work Sequencing Plan to the Engineer for review prior to beginning any construction activity, unless otherwise approved by the Engineer.
- M. Contractor shall be aware that this project will be completed simultaneously with other construction projects so contractor will be required to provide weekly updates to project schedule timelines, attend weekly project meetings, and coordinate

construction scheduling and activities to allow access to work zones and job site for all contractors.

1.6 CONTRACTOR'S USE OF PREMISES:

- A. Contractor shall limit the use of the premises for the performance of the Work and storage of materials and equipment.
- B. Contractor shall coordinate with Owner, access for normal maintenance requirements.
- C. Contractor shall assume full responsibility for security of all his and his subcontractors' materials and equipment stored on the site.
- D. If directed by the Owner, Contractor shall move stored items which interfere with operations of Owner.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.
- F. The Contractor shall coordinate with the City Police Department and maintain access for local traffic, pedestrians, and emergency vehicles at all times.

1.7 UNDERGROUND UTILITIES

- A. The underground utilities indicated on the drawings are considered approximate as to their existence, size, and location. In the event that additional utilities are encountered that are not shown on the drawings, 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 the Owner. The Contractor shall be responsible for contacting Dig Safe at 1-888-344-7233 and the City of Salem for utility mark out prior to commencing work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01010

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SCOPE

- A. Payment for the items specified in the Bid Schedule, shall include compensation for furnishing all labor, tools, equipment, supplies, and manufactured articles, and for all operations, and incidentals appurtenant to the items of work described, to complete the various items of the WORK, all in accordance with the requirements of the Contract Documents, Drawings, Specifications, Addendum, and other Modifications issued by and approved by the Owner and Engineer, including all costs for permits, compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). The prices named in the Bid Schedule shall include all Work items described or implied in the Contract Documents, Drawings, Specifications, Addendum, and other Modifications issued by and approved by the Owner and Engineer, and all other Work items necessary to manufacture, install, test, and start-up a complete working project.

- B. Work items to be included in the Bid Schedule prices, not included for separate payment elsewhere include, but are not limited to:

Preconstruction videos and photographs; construction photographs;

Coordination and cooperation with other utilities and contractors working within the work zone during the contract period;

Tree pruning, protection, and maintenance;

Providing sanitary facilities and construction trailer with power onsite throughout project;

Securing additional staging areas, establishing staging area with vehicular and pedestrian protection, security of staging area and work zone, protecting and maintaining staging area and construction yard, removal and cleaning up of staging area;

Saw cutting, excavation, handling, hauling, and disposal of materials within trench limits of payment; including pavement, curbing, sidewalk, and surface materials including surface soil, trees, stumps, conduits, footings and pole foundations, and temporary curbing and pavement installed during project;

Excavation, temporary support of excavation, removal of excavation support;

Furnishing and installing crushed stone, pipe bedding materials, filter fabric, Class I and Class II backfill, gravel backfill, common fill, detectable warning tape as required, and gravel subbase material in trenches and within limits of payment; including replacement of soils determined by Engineer to be unsuitable for backfill;

Backfill and compaction; compaction testing;

Excavation, handling, segregation, storage, and re-use as directed of excavated soil materials to the maximum extent practicable and as directed; handling, temporary storage, segregation, and poly encasement under and over soil stockpiles; handling, treating, and discharging water drainage from soil stockpiles;

Securing legal soil disposal location(s), communicating with disposal location(s) for sampling requirements if applicable, and sampling and analysis of excess or unsuitable soils as required by receiving location or facility for disposal, including the number of samples and specific analysis required;

Furnishing and installing filter fabric, mulch sock, and silt fence around stockpiles, and along excavation as required; furnishing installing, and maintaining silt sacks in all catch basins; furnishing and installing geotextile and filter fabric for utility construction as directed;

Construction dewatering to control groundwater, wet weather or tidally influenced groundwater, or leakage or exfiltration from sewer pipes and manholes and underdrains; including pumps, piping, dirt bag filters, and sedimentation tanks; permitting if required for non-recharge discharge as required by EPA NDES program; including characterization, testing, filtration, and treatment if required of construction dewatering water; furnishing and installing clay cutoff walls if required;

Locating, supporting, bracing, and protecting existing utility pipes, services, conduits, duct banks, traffic light poles, and utility poles, including temporary pole support and removal and replacement of cable guy pole support;

Abandonment of existing utilities, installing mortar plugs in all abandoned pipes and conduits smaller than 8-inches in diameter, removal and disposal of existing, abandoned or relocated utilities;

Removal and replacement of water mains, active or abandoned sewer pipes and mains, or other utilities in conflict with construction;

Concrete encasement, including external pipe wrap if required, of impacted utilities if water and sewer separation requirements are not met;

Concrete cradles, pipe connections, anchor bolts, and field closures;

Dust control – including water and calcium chloride, regular sweeping, and removing snow from streets and sidewalks where work is ongoing, repair of existing and developing potholes within project area;

Snow removal from streets and sidewalks within project limits on all streets that are not fully paved, have castings or steel plates that may hinder municipal snow removal, or have any equipment and or material stored;

Transporting trash and recyclables out of the work area if municipal pickup is hindered;

Traffic regulation and control, pedestrian and vehicular protection, coordination of police details, obtaining and posting No Parking restrictions;

Cold patch or “temporary” bituminous paving for traffic control, safety, or other use as directed by the Engineer outside the trench limits of payment;

Installation, disinfection, testing, maintenance, and removal of temporary water mains and services installed by the Contractor after the start of construction without the direction of the Owner or in response to construction related water main break;

Bagging hydrants not in service, raising buried valves, dewatering existing water manholes and structures;

Preparation of water valve operation and water service interruption sequencing plan, preparation and distribution of “start of work” notices, and service interruption notification flyers to affected residents as directed by the City;

Planning for and dealing with water leakage from all existing water valves during construction and when making all connections between new and existing water mains and services;

Dewatering of construction trench to control leakage from all existing water valves during construction as required to make all connections between new and existing water mains and services;

Removing and resetting all signs, bollards, benches, fences, posts, poles, gates, walls, landscaping, boulders, plantings and all other surface features on public and private property which may need to be removed for construction;

Coordination with the utility companies for the relocation, protection, support, and other work required to facilitate the completion of the project including but not limited to natural gas pipe replacement by National Grid, telecommunications conduits and manhole replacement by Verizon, cable conduit replacement by Comcast or other, and City of Salem utility repair and maintenance needs. Provide access for utility owners and operators to their respective utilities; and communicating with affected homeowners and residents;

Attend City and neighborhood meetings if required;

Submitting work plans and shop drawings; fulfilling all reporting requirements;

Preparation and submission of monthly and final record drawing information;

Rodent control plan submission, rodent control during construction;

Night work and related equipment including work lights and traffic indicator lights;

Clean-up and restoration of all surface features not included for payment elsewhere;

- C. The Contractor and Subcontractors shall not take advantage of any apparent error or omission on the Drawings or Specifications. They shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents at no additional cost to the Owner. The Owner reserves the right to reject any and all bids.

- D. The term furnish means supply and deliver to the Project site, including the actual unloading, unpacking, assembly, erection, placing, installation, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, unless stated otherwise.

1.2 LUMP SUM ITEMS

- A. Measurement and payment for work performed shall be based on the percent complete for the various lump sum prices on the approved schedule of values.
- B. Payment for the lump sums shall be full compensation for all labor, materials and equipment required to furnish, install, construct, startup and test the work covered under that lump sum item.
- C. Payment shall also fully compensate the Contractor for any other work which is not specified or shown, but which is necessary to complete the work.

1.3 MEASUREMENT FOR PAYMENT

- A. Work completed to date, measured as a percentage of the total Work, shall be submitted by the Contractor and substantiated as required by the Owner.
- B. The Owner will review the submittal for completeness and verification.
 - 1. Include a checklist of completed items; only signed-off items will be considered for payment.
 - 2. Include red-lined drawings indicating degree of completion.
- C. Unit Price Items: Measurement for payment shall be based upon the measured quantity as described in this measurement and payment section.

1.4 BID ITEMS

Measurement and payment for each Bid Item in the Bid Form shall be as set forth below:

Item No.1 – Mobilization/Demobilization

A. Measurement

Measurement for payment shall be based on a lump sum basis, and will be limited to 50% of the lump sum amount of this item until the work is complete and the contractor has completely demobilized including restoration and cleanup of staging areas. The initial payment of 50% mobilization costs shall be payable when the Contractor is operational on site. Operational shall mean the substantial commencement of work on site, not prior to commencement. The lump sum price bid for mobilization shall not exceed 5 percent of the total contract price.

B. Payment

Payment for Item No.1 – Mobilization/Demobilization will be at the lump sum price bid for this item in the proposal. Under the lump sum price bid for this item, the Contractor shall move his equipment to the site and prepare to begin construction. It shall also include payment for demobilization of equipment at the completion of the Project. Mobilization costs include all costs of initiating the Contract, exclusive of the cost of materials. Mobilization includes securing and establishing a staging area for materials and equipment,

including erosion and sedimentation controls, setting up construction trailer, submitting required shop drawing and work plan submittals, distributing contact numbers for Contractor's staff to Owner and Engineer, preparing and submitting all work plans and submittals, performing a pre-construction video for the entire project area identifying all surface features including sidewalks, roads, curb lines, structures, signs, signals, driveway aprons, and all other surface features within the right-of-way, and transporting all necessary trucks and construction equipment to the site necessary to begin construction.

Item No. 2 – Traffic and Pedestrian Safety and Management

A. Measurement

Measurement for payment will be based on the percentage of project completion based on elapsed time compared to the contractual construction time limit.

B. Payment

Payment for Item No. 2 – Traffic and Pedestrian Safety and Management will be based on the Unit Price bid for this item in the proposal. Under the Lump Sum price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment and incidentals required for traffic and pedestrian safety and management to minimize disruption to the normal traffic and pedestrian patterns in the area of the Work, protect vehicular and pedestrian traffic, secure the staging area and work zone, and inform the residents; at a minimum including the signage and other requirements shown on Sheets C-8 and C-17, as required by the Owner. The work includes all items included in this Section's Paragraph 1.1B, above, as well as providing signs, cones, barrels, concrete barriers with chain link fence and protective boards and reflective striping and indicator lights, security fencing, line striping and direction arrow paint "blackout" and replacement, reflective break away traffic delineator posts, lane indicators, steel plates, steel plate welding and wedging, all other necessary devices, and all incidental work not included for payment elsewhere.

The lump sum payment for this item shall be full compensation for all traffic regulation and control measures as described by the Owner with the exception of Traffic Officers which will be reimbursed directly by the Owner and variable programmable message boards to be measured under Item No. 3.

Item No. 3 – Variable Programmable Message Boards

A. Measurement

Measurement will be based on the number of days each message board is onsite and operational as requested by the Owner. The days the board is onsite without request from the Owner will not be measured for payment.

B. Payment

Payment for Item No. 3 – Variable Programmable Message Boards will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install variable, programmable, portable message board signs as directed by the Owner. The work includes all items included in this Section's Paragraph 1.1B, above, as well as procuring, delivering, installing, programming, powering, and maintaining portable, variable message board signs as directed, with minimum display size of 74-inch high and 98-inch wide, and all incidental work not included for payment elsewhere.

Item No. 4 – Surveying

A. Measurement

Measurement for payment will be based on the percentage completion of each task as determined by the Engineer according to the Contractor's submitted schedule of values as approved by the Engineer.

B. Payment

Payment for Item No. 4 – Surveying shall be based on the Lump Sum Price bid for this item in the proposal. Under the Lump Sum price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete field survey by professional land surveyor (MA) to establish and confirm elevations and depths of existing utilities, establish and maintain construction benchmarks, and prepare record drawing to identify locations of installed utilities. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as establishing at least a dozen construction benchmarks on project datum, replacing or maintaining benchmarks during construction; confirming the rim and invert elevations of all pipes in manholes or structures to be modified or connected to as part of this project, and top of pipe and pipe invert depths and elevations, in conjunction with confined space entry and exploratory excavation by the contractor; surveying in location and depth of critical utility features including manholes, sewer service taps, water service taps, bends on water and gas pipe, gas and water valve locations, termination locations of all conduit runs, and periodic pipe and conduit locations; preparing and submitting record survey locations in AutoCAD and PDF format, and all incidental work not included for payment elsewhere.

Item No. 5 – Demolition

A. Measurement

Measurement for payment will be based on the percentage completion of each task as determined by the Engineer according to the Contractor's submitted schedule of values as approved by the Engineer.

B. Payment

Payment for Item No. 5 – Demolition shall be based on the Lump Sum Price bid for this item in the proposal. Under the Lump Sum price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete demolition within the project area, including the parking lot and public ways, including all work shown on Sheet C-6, and as required and directed to complete the work. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as coordinating with the City Electric Dept. regarding disconnection of lights and signals, locating and protecting City fire signal lines, reprogramming traffic and pedestrian light sequence and timing, wiring temporary or permanent City conduits and wires as required to power lights and signals outside project area as required; removal, disconnecting, burying, protecting with steel plates as required of traffic, pedestrian, and sprinkler control boxes; removal, storage, maintaining, or replacing plantings removed from traffic island; removal of traffic island, blackout painting existing line striping and arrows; supporting existing traffic light support pole and utility poles, modification of traffic light support cables as required; removal, hauling, and disposal of all surface features and materials removed during demolition; furnishing and installing crushed stone and gravel to replace removed materials as directed, and all demolition related and incidental work not included for payment elsewhere.

Removing and stacking granite curbs will be measured for payment under Item No. 6. Installing bituminous concrete curb/berm will be measured for payment under Item No. 54.

Installation of temporary or permanent City conduits and wires as directed will be measured under Item No. 51.

Item No. 6 – Remove and Stack Granite Curb

A. Measurement

Measurement for payment will be based on the actual linear feet of straight and curved granite curb removed, delivered, and stacked at a location directed by the Owner as measured by the Engineer along the long end of straight curb or around the outer radius of the curved curb. Granite curb removed but not selected by the owner for salvage or curb broken during construction will not be measured for payment.

B. Payment

Payment for Item No. 6 – Remove and Stack Granite Curb shall be based on the Unit Price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove, deliver, and stack straight and curved granite curb complete as indicated on the Drawings and as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw-cutting pavement, excavation, removal and disposal of existing pavement and concrete curb encasement and backfill, removal of curb, cleaning dirt and concrete from all curb selected by the owner for salvage, delivery and stacking of salvaged curb at a location directed by the Owner, disposal of all granite curb broken during construction or not selected by the Owner for salvage, all incidental work not included for payment elsewhere.

Item No. 7 – Modify Sewer Sluice Gate Structure

A. Measurement

Measurement for payment will be based on the percentage completion of each task as determined by the Engineer according to the Contractor's submitted schedule of values as approved by the Engineer.

B. Payment

Payment for Item No. 7 – Modify Sewer Sluice Gate Structure shall be based on the Lump Sum Price bid for this item in the proposal. Under the Lump Sum price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete modification and demolition of the sewer sluice gate structure, as shown on Sheet C-16, and as required and directed to complete the work. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as coordinating with the City Electric Dept. regarding disconnection of conduits and wiring; saw-cutting, excavation, and support of excavation to expose structure top slab; field verifying the size of the cast opening and ordering and installing custom size square "sewer" frame and cover; removing the "removable concrete slab" which may have been previously removed and cast in place by others since original installation; power washing and cleaning structure of debris before and after demolition and modification work; providing confined space entry crew and safety equipment including safe access into structure by Engineer if required; removal of all conduits and equipment as indicated and as directed including sluice gates, motors, frames, posts, wheels, flanges, bolts, conduits, wires, etc.; dewatering including pumping, stop logs, and plugs as required; repair concrete stop log slots and/or install grouted galvanized channels to receive new stop logs, furnish and install new stop logs as required; install brick and mortar plug in 42-inch pipe and removal of concrete plug in 36-inch pipe after sewer work is complete,

patch or grout pipe and pipe connections to structure as directed; furnish and install or maintain steel plate over structure during construction to allow vehicular traffic to cross structure if required; installing new frame and cover; providing a structural design and certificate of design from a professional engineer for new reinforced concrete “removable concrete slab” H-25 rated; constructing new reinforced concrete “removable concrete slab” with lifting hooks, strip and remove forms and debris; backfill and compaction, and all incidental work not measured for payment elsewhere.

Item No. 8 – Exploratory Excavation

A. Measurement

Measurement for payment will be based on the actual cubic yards of material displaced during exploratory excavation and backfilled as directed and as measured by the Engineer based on dimensions of open excavation. Exploratory excavations that are not backfilled and compacted prior to beginning any work in the excavation that can be measured for payment elsewhere will not be measured for payment. Access pits and obstruction removal pits removal pit excavated for cleaning and lining operations will not be measured for payment.

B. Payment

Payment for Item No. 8 – Exploratory Excavation will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete exploratory excavations as necessary to locate, measure, or observe pipe, structures, utilities, other possible obstructions, and as directed. The work includes all items included in this Section’s Paragraph 1.1B, above, as well as signal tracing to identify pipe locations before excavation, saw-cutting, temporary support of excavation, excavation; tapping existing water mains to determine if mains are active; cutting and removal of section of existing sewer service laterals or sewer/drain main pipe within excavation, coordination with pipeline cleaning and CCTV inspection crews to gain access to the pipe for inspection, snaking existing service laterals to edge of public way and confirm length with field measurements to enable Engineer to determine if cleaning and CCTV inspection is required and if services should be connected to the sewer or drain main pipe; coordination and scheduling with Engineer to allow cut sewer service laterals to be observed safely from the construction trench to enable Engineer to determine if cleaning and CCTV inspection is required, reconnecting removed section of active service laterals or sewer/drain pipe with Fernco Couplings, replacing with PVC pipe if required, installing mortar plugs in inactive service laterals, placing backfill, compaction, furnishing and placing gravel base under paved area; repair of any utility lines and services broken during construction; and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 9 – Rock Excavation (Minimum)

A. Measurement

Measurement for payment will be based on the actual cubic yards of rock excavated, removed, and disposed of from within the Trench Payment Limits as indicated in the Drawings and as measured by the Owner or Engineer. Rock encountered during excavation that measures less than one (1) cubic yard, rock that can be removed without use of rock hammer or blasting, or rock encountered outside the trench payment limits, will not be paid under this item and will not justify any additional payment.

B. Payment

Payment for Item No. 9 - Rock Excavation (Minimum) shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to excavate, remove, and dispose of rock from trenches and excavated areas. The work includes all items included in this Section's Paragraph 1.1B, above, as well as drilling, hammering, blasting if allowed by owner, rock disposal, pre-blast surveys and coordination with Fire Department, and all related work, and all incidental work not included for payment elsewhere.

Item No. 10 – Rock Excavation (Additional)

A. Measurement

Measurement for payment will be the quantity measured under Item No. 9. Rock encountered during excavation that measures less than one (1) cubic yard, or rock encountered outside the trench payment limits, will not be paid under this item and will not justify any additional payment.

B. Payment

Payment for Item No. 10 - Rock Excavation (Additional) shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall include additional costs for performing rock excavation and disposal should he decide that the minimum unit price in Item No. 9 is insufficient compensation.

Item No. 11 – Earth Excavation and Refill Below Normal Depth

A. Measurement

Measurement for payment will be based on the actual cubic yards of unsuitable material excavated, stored, and replaced with suitable gravel below normal depth to as directed by the Engineer and as measured by the Engineer. Earth excavation and refill below normal depth without prior authorization from the Engineer will not be measured for payment.

B. Payment

Payment for Item No. 11 – Earth Excavation and Refill Below Normal Depth will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to excavate and refill such materials as necessary beneath the normal depth to replace unsuitable soil materials as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as temporary support of excavation, excavation, handling, and storage of unsuitable soils below normal depth; furnishing and installing gravel backfill or gravel base under paved area; repair of any utility lines and services broken during construction; and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 12 – Loading, Hauling, and Disposal of Excess or Unsuitable Soil

A. Measurement

Measurement for payment will be based on the actual cubic yards of excess or unsuitable soil loaded, hauled, and legally disposed of unsuitable material excavated, legally disposed, as directed by the Engineer and as measured by the Engineer. Rock, pipe, or removed manholes will not be measured for payment. Excess soil that is suitable for reuse as determined by the Engineer but not segregated by contractor and mixed with unsuitable soil will not be measured for payment. Excess soil that can be reused as determined by the

Engineer and disposed of without prior authorization from the Engineer will not be measured for payment. Soils suitable for reuse that become unsuitable for reuse because they were mixed with unsuitable soils, or became too wet due to insufficient dewatering or bypass pumping in the opinion of the Engineer will not be measured for payment. Surface materials removed as part of Bid Item No. 5 – Demolition and Bid Item No. 52 – Stripping will not be measured for payment.

B. Payment

Payment for Item No. 12 – Loading, Hauling, and Disposal of Excess or Unsuitable Soil will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to load, haul, and dispose of excess or unsuitable soil materials as authorized and measured by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as locating soil material disposal locations or facilities, coordinating with disposal locations and facilities on sampling requirements if required, segregating soil for reuse or by soil type; loading, hauling with covered trucks, and legal disposal of soil materials, sweeping and cleaning up soil stockpile areas and hauling route if required; and all incidental work not measured for payment elsewhere. Additional costs for tipping fees for disposal of soil at a landfill or regulated facility if required will be paid under Item No. 13.

Item No. 13 – Additional Cost for Soil Disposal

A. Measurement

Measurement for payment will be based on the actual additional cost (tipping fees) to dispose soil at a Massachusetts or out-of-State landfill or other regulated facility if soil is determined to contain chemical concentrations equal to or exceeding Massachusetts Contingency Plan (MCP) Reportable Concentrations (costs in addition to the loading, hauling, and disposal measured for payment under Bid Item No. 12).

Soils disposed at a landfill or other regulated facility that do not contain reportable chemical concentrations and/or are considered "clean" under the MCP, or are not sampled and tested, will not be measured for additional payment under Item No. 13. Loading and hauling the soil will be measured for payment under Bid Item No. 12.

B. Payment

Payment for Item No. 13 – Additional Cost for Soil Disposal will be based on the actual amount invoiced to the Contractor by the disposal facility without overhead or profit applied. The work includes all items included in this Section's Paragraph 1.1B, above, as well as locating soil material disposal locations or facilities, coordinating with disposal locations and facilities on sampling requirements if required, segregating soil for reuse or by soil type; producing weight slips and required paperwork for regulated soil hauling and disposal; and all incidental work not measured for payment elsewhere.

Item No. 14 – Provide and Install Controlled Density Fill

A. Measurement

Measurement for payment will be based on the actual cubic yards of excavatable, controlled density fill (CDF) installed as directed, approved, and measured by the Engineer based on delivery slips produced by CDF supplier. CDF installed without prior approval of the Engineer or excess volume due to overspill will not be measured for payment.

B. Payment

Payment for Item No. 14 – Provide and Install Controlled Density Fill will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish, install, pump, spread, and vibrate CDF as directed to backfill around pipes and structures and to fill abandoned pipes and structures as indicated on the plans and as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordinating with CDF supplier for deliveries, traffic coordination, installing CDF as directed; protecting CDF with steel plates until cured if required; providing pumps, vibratory equipment, temporary fill piping, and bulkheads or temporary shoring as required to fill abandoned pipes or structures and/or to minimize overspill volume as directed; and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 15 – Support of Excavation, Left in Place

A. Measurement

Measurement for payment will be based on the actual square yards of support of excavation (SOE) materials left in place as directed, approved, and measured by the Engineer. SOE materials to be measured for payment include interlocking sheet piles or steel soldier piles with timber lagging or steel plates, timber or wooden SOE will not be measured for payment. SOE left in place will be measured based on the square yards of exposed SOE in the trench from pipe or structure invert to the top of the SOE after cut-off at 8-foot minimum depth. SOE anchored into undisturbed soils and unexposed below the bottom of trench will not be measured for payment. SOE left in place without prior authorization from the Engineer will not be measured for payment.

B. Payment

Payment for Item No. 15 – Support of Excavation, Left in Place will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish, install, brace, maintain, and leave in place interlocking steel sheeting SOE or steel sheet pile and timber lagging SOE. The work includes all items included in this Section's Paragraph 1.1B, above, as well as providing an SOE design and certificate of design from a professional engineer; protecting or temporarily relocating and replacing existing overhead utilities, cables, and signals; traffic coordination; pre-excavation, installing SOE guides, installing SOE with vibratory or other method, bracing sheets or piles, cutting off and removing cut-off SOE, and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 16 – Bypass Pumping

A. Measurement

Measurement for payment will be based on the percentage completion of each task as determined by the Engineer according to the Contractor's submitted schedule of values as approved by the Engineer.

B. Payment

Payment for Item No. 16 – Bypass Pumping will be based on the Unit Price bid for this item in the proposal. Under the Lump Sum price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment and incidentals required to control or bypass flows from sewer and drainage conduits, including wet weather and tidal flows in South

River conduit as required to complete the work. The work includes all items included in this Section's Paragraph 1.1B, above, as well as monitoring weather, tidal, and sanitary flow patterns and scheduling work accordingly around low flow and low tide conditions whenever possible; investigating and entering manholes to confirm manhole and pipe size and dimensions and potential to divert flow between sewers on Canal Street; furnishing, installing, and maintaining primary and redundant sound attenuated bypass pumps capable of handling wet weather flows (with capacity at a minimum to handle flows provided in specifications for reference); providing level transducer and auto-dialer, redundant floats, piping and valves including welded HDPE piping or other piping as approved by Engineer; modifying and repairing manholes as required to install suction or discharge piping; providing 24-hour maintenance and onsite staffing during bypass operations; providing inflatable plugs, stop logs, restrained sand bags, including diverting flow between sewer pipes on Canal Street if required; saw-cutting, burying, and paving temporary bypass piping to prevent traffic or pedestrian conflicts; providing traffic and pedestrian controls to protect pumps and piping; providing spill containment for pumps; and all incidental work not included for payment elsewhere.

Item No. 17 – Furnish and Install 42-inch PP Sewer Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 42-inch diameter polypropylene (PP) sewer pipe installed at all depths, complete as measured by the Engineer along the centerline of the pipe, through the fittings between the inside face to inside face of structures or between the points of connection with existing pipes.

B. Payment

Payment for Item No. 17 – Furnish and Install 42-inch PP Sewer Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 42-inch diameter polypropylene (PP) sewer pipe, triple walled SaniTite HP pipe (or other sewer pipe designed for 30-foot bury depth with watertight sanitary grade joints) complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure at point of connection, removal and legal disposal of existing pipe and fittings, removal of existing support of excavation previously left in place if required, installation of new 42-inch PP SaniTite HP sewer pipe, SaniTite fittings, gaskets, couplings, and concrete field closures as required; installing and compacting foundation, bedding, haunch, and backfill materials; installing pipe in accordance with manufacturer's requirements and details; repair and modification of existing structures around point of connection as required; and all incidental work not specifically included for payment elsewhere.

Item No. 18 – Furnish and Install 36-inch PP Sewer Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 36-inch diameter polypropylene (PP) sewer pipe installed at all depths, complete as measured by the Engineer along the centerline of the pipe, through the fittings between the inside face to inside face of structures or between the points of connection with existing pipes.

B. Payment

Payment for Item No. 18 – Furnish and Install 36-inch PP Sewer Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 36-inch diameter polypropylene (PP) sewer pipe, triple walled SaniTite HP pipe (or other sewer pipe designed for 30-foot bury depth with watertight sanitary grade joints) complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure at point of connection, removal and legal disposal of existing pipe and fittings, removal of existing support of excavation previously left in place if required, installation of new 36-inch PP SaniTite HP sewer pipe, SaniTite fittings including bends and connection coupling to existing pipe, gaskets, couplings, and concrete field closures as required; installing and compacting foundation, bedding, haunch, and backfill materials; installing pipe in accordance with manufacturer's requirements and details; repair and modification of existing structures around point of connection as required; and all incidental work not specifically included for payment elsewhere.

Item No. 19 – Furnish and Install 24-inch PP Sewer Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 24-inch diameter polypropylene (PP) sewer pipe installed at all depths, complete as measured by the Engineer along the centerline of the pipe, through the fittings between the inside face to inside face of structures or between the points of connection with existing pipes.

B. Payment

Payment for Item No. 19 – Furnish and Install 24-inch PP Sewer Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 24-inch diameter polypropylene (PP) sewer pipe, triple walled SaniTite HP pipe (or other sewer pipe designed for 30-foot bury depth with watertight sanitary grade joints) complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure at point of connection, removal and legal disposal of existing pipe and fittings, removal of existing support of excavation previously left in place if required, installation of new 24-inch PP SaniTite HP sewer pipe, SaniTite fittings including bends, gaskets, couplings, and concrete field closures as required; installing and compacting foundation, bedding, haunch, and backfill materials; installing pipe in accordance with manufacturer's requirements and details; repair and modification of existing structures around point of connection as required; and all incidental work not specifically included for payment elsewhere.

Item No. 20 – Furnish and Install 12-inch PVC Sewer Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 12-inch diameter PVC sewer pipe installed, complete as measured by the Engineer along the centerline of the pipe, through the fittings, between the inside face to inside face of structures or

between the points of connection with existing pipes, including piping installed in manhole to construct inside-drop connections.

B. Payment

Payment for Item No. 20 – Furnish and Install 12-inch PVC Sewer Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 12-inch diameter PVC sewer pipe complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure, removal and legal disposal of existing pipe and fittings, installation of new 12-inch PVC pipe, fittings, couplings, and caps as required; installation of pipe, fittings, and stainless steel supports and clamps for inside drop connections in manholes; repair and modification of existing structures around point of connection as required; installation of crushed stone bedding, and all incidental work not specifically included for payment elsewhere.

Item No. 21 – Furnish and Install 8-inch PVC Sewer Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 12-inch diameter PVC sewer pipe installed, complete as measured by the Engineer along the centerline of the pipe, through the fittings, between the inside face to inside face of structures or between the points of connection with existing pipes, including piping installed in manhole to construct inside-drop connections.

B. Payment

Payment for Item No. 21 – Furnish and Install 8-inch PVC Sewer Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 8-inch diameter PVC sewer pipe complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure, removal and legal disposal of existing pipe and fittings, installation of new 8-inch PVC pipe, fittings, couplings, and caps as required; installation of pipe, fittings, and stainless steel supports and clamps for inside drop connections in manholes; repair and modification of existing structures around point of connection as required; installation of crushed stone bedding, and all incidental work not specifically included for payment elsewhere.

Item No. 22 – Furnish and Install 18-inch HDPE or DI Drain Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 18-inch diameter HDPE or DI drain pipe installed, complete as measured by the Engineer along the centerline of the pipe, through the fittings, between the inside face to inside face of structures or between the points of connection with existing pipes, including piping installed in manhole to construct inside-drop connections.

B. Payment

Payment for Item No. 22 – Furnish and Install 18-inch HDPE or DI Drain Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 18-inch diameter HDPE or DI drain pipe complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure, removal and legal disposal of existing pipe and fittings, installation of new 18-inch HDPE or DI drain pipe, fittings, couplings, and caps as required; installation of pipe, fittings, and caps; repair and modification of existing structures around point of connection as required; installation of crushed stone bedding, and all incidental work not specifically included for payment elsewhere.

Item No. 23 – Furnish and Install 12-inch HDPE or DI Drain Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of new 12-inch diameter HDPE or DI drain pipe installed, complete as measured by the Engineer along the centerline of the pipe, through the fittings, between the inside face to inside face of structures or between the points of connection with existing pipes, including piping installed in manhole to construct inside-drop connections.

B. Payment

Payment for Item No. 23 – Furnish and Install 12-inch HDPE or DI Drain Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 12-inch diameter HDPE or DI drain pipe complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing pipe or structure where new pipe connection will be made; field verification of internal and external diameter of pipe or structure, removal and legal disposal of existing pipe and fittings, installation of new 12-inch HDPE or DI drain pipe, fittings, couplings, and caps as required; installation of pipe, fittings, and caps; repair and modification of existing structures around point of connection as required; installation of crushed stone bedding, and all incidental work not specifically included for payment elsewhere.

Item No. 24 – Furnish and Install New Catch Basins or Manholes

A. Measurement

Measurement for payment will be based on the number of vertical feet of new catch basins or manholes (3 to 5 foot inside diameter) installed by the Contractor, as approved and measured by the Engineer from the lowest pipe connection invert or catch basin sump to the top of the frame. Measurements for payment will be rounded up to the nearest 0.1 vertical feet. Reconstructing or modifying structures as part of Bid Items Nos. 16, 26, 29, and 31 will not be measured for payment.

B. Payment

Payment for Item No. 24 – Furnish and Install New Catch Basins or Manholes shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this

item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new catch basins or manholes complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as installing crushed stone base with geotextile mat as required; furnishing and installing new catch basins or manholes of various depths, shapes, and diameters from 3 to 5 feet as directed by the Engineer, including typical (4-5)-foot diameter precast concrete manholes, smaller or larger diameter precast manholes, drop over manholes, manholes over existing pipe, typical block and mortar structures with waterproofing sealant, catch basins, and catch basin gutter inlets (CBGI) complete. Structures to include precast or cast-in-place concrete bases, precast concrete or brick/block riser sections and cones, precast concrete cones or flat-top covers, cut or cast openings for pipe connections, installation of new frames and covers/grates; bituminous damp proofing; steps, brick tables and inverts, fabrication and installation of internal or external drop pipes, fasteners, steel rebar, class A and B concrete as required; connecting to existing or proposed pipes with rubber sleeves, modification of pipes as required to make connections, connections to existing or proposed pipes, fittings as required; concrete, bricks, and mortar to raise frames to grade; concrete collars; testing of the completed manhole, and all incidental work not included for payment elsewhere. Furnishing and delivering new cast iron frames and covers/grates will be measured for payment under Bid Item No. 33. Furnishing and installing pipe for drop connections will be measured for payment under Bid Item Nos. 20 and 21. Field core drill connections as directed will be measured for payment under Bid Item No. 26 and 27.

Item No. 25 – Furnish and Install New 8-Foot Diameter Manholes

A. Measurement

Measurement for payment will be based on the number of vertical feet of new 8-foot diameter manholes installed by the Contractor, as approved and measured by the Engineer from the lowest pipe connection invert to the top of the frame. Manholes with 8-foot lower diameters and cones with reduced upper diameters will be measured as 8-foot diameter manholes. Measurements for payment will be rounded up to the nearest 0.1 vertical feet. Reconstructing or modifying structures as part of Bid Items Nos. 16, 27, 29, and 31 will not be measured for payment.

B. Payment

Payment for Item No. 25 – Furnish and Install New 8-Foot Diameter Manholes shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new manholes complete as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as installing crushed stone base with geotextile mat as required; furnishing and installing new manholes of various depths, shapes, and lower inside diameters of at least 8-feet as directed by the Engineer, including reducing flat-top or cone sections, (4-5)-foot diameter precast concrete riser sections, upper cones or flat-tops, larger diameter precast manholes; including drop over manholes and manholes over existing pipe. Structures to include precast or cast-in-place concrete bases, precast concrete or brick/block riser sections and cones, precast concrete cones or flat-top covers, cut or cast openings for pipe connections, installation of new frames and covers/grates; bituminous damp proofing; steps, brick tables and inverts, fabrication and installation of internal or external drop pipes, fasteners, steel rebar, class A and B concrete as required; connecting to existing or proposed pipes with rubber sleeves, A.Lok Premium compression sleeve, or A.Lok Field Sleeve; modification of pipes as required to make

connections, connections to existing or proposed pipes, fittings as required; concrete, bricks, and mortar to raise frames to grade; concrete collars; testing of the completed manhole, and all incidental work not included for payment elsewhere. Furnishing and delivering new cast iron frames and covers/grates will be measured for payment under Bid Item No. 33. Furnishing and installing pipe for drop connections will be measured for payment under Bid Item Nos. 20 and 21. Field core drill connections as directed will be measured for payment under Bid Item No. 26 and 27.

Item No. 26 – Core Connect to Existing Pipe or Structure, Less than 24-inch

A. Measurement

Measurement for payment will be based on the number of complete cored drilled circular openings (less than 24-inches in diameter) made to existing or new sewer or drain main pipe or structure complete, to allow connection of service or main pipe, as directed by Engineer and as measured and approved by the Engineer. Repair of sewer or drain main pipe or structure and/or repeat cored connections due to pipe or structure damaged during cored connections will not justify additional payment, square cut or knocked out openings in pipes or structures will not be measured as core drill connections.

B. Payment

Payment for Item No. 26 – Core Connect to Existing Pipe or Structure, Less than 24-inch will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to connect or redirect sewer or drain pipes or services to sewer or drain main pipe or structure, complete as specified or required by Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw cutting and excavation to locate, expose, and support sewer or drain main pipe or manhole/catch basin structure; field verification of internal and external diameter of sewer or drain main pipe or structure; core drilling sewer or drain main pipe or structure with circular bit sized for service to be connected complete with Inserta-Tee, rubber saddle or boot, A.Lok Premium compression sleeve, or A.Lok Field Sleeve; connecting proposed pipe or service to pipe or service pipe to structure, furnish and installing of Inserta-Tee, saddle or boot, A.Lok Premium compression sleeve, A.Lok Field Sleeve, stainless steel bands, fittings; forming concrete and grout to cast sleeve into manhole; connecting the new PVC, PP, HDPE, or DI, and all incidental work not included for payment elsewhere.

Item No. 27 – Core Connect to Existing Pipe or Structure, 24-inches or Greater

A. Measurement

Measurement for payment will be based on the number of complete cored drilled circular openings (24-inches in diameter or greater) made to existing or new sewer or drain main pipe or structure complete, to allow connection of service or main pipe, as directed by Engineer and as measured and approved by the Engineer. Repair of sewer or drain main pipe or structure and/or repeat cored connections due to pipe or structure damaged during cored connections will not justify additional payment, square cut or knocked out openings in pipes or structures will not be measured as core drill connections.

B. Payment

Payment for Item No. 27 – Core Connect to Existing Pipe or Structure, 24-inches or Greater will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to connect or redirect sewer or drain pipes or services to sewer or drain main pipe or structure, complete as specified or required by Engineer. The work includes

all items included in this Section's Paragraph 1.1B, above, as well as saw cutting and excavation to locate, expose, and support sewer or drain main pipe or manhole/catch basin structure; field verification of internal and external diameter of sewer or drain main pipe or structure; core drilling sewer or drain main pipe or structure with circular bit sized for service to be connected complete with Inserta-Tee, rubber saddle or boot, A.Lok Premium compression sleeve, or A.Lok Field Sleeve; connecting proposed pipe or service to pipe or structure, furnish and installing of Inserta-Tee, saddle or boot, A.Lok Premium compression sleeve, A.Lok Field Sleeve, stainless steel bands, fittings; forming concrete and grout to cast sleeve into manhole; connecting the new PVC, PP, HDPE, or DI, and all incidental work not included for payment elsewhere.

Item No. 28 – Remove and Dispose or Abandon Existing Structures

A. Measurement

Measurement for payment will be based on the total number of existing sewer or drain manhole or catch basin structures removed completely and disposed or partially removed and abandoned by the Contractor as shown on plans and as directed and approved by the Engineer. Structures modified as part of Bid Item Nos. 16 or 29 will not be measured for payment.

B. Payment

Payment for Item No. 28 – Remove and Dispose or Abandon Existing Structures shall be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove and dispose or partially remove and abandon existing sewer or drain manhole or catch basin structures complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw-cutting, removing and disposing sidewalk and pavement materials; remove existing frames and covers and delivery to Owner if selected by Owner for salvage, disposal of existing frames and covers not selected for salvage by Owner; saw-cutting existing pipe connections; removal and disposal of brick, block, or concrete structure lid, cone, walls, base or corbel as directed; providing and compacting gravel fill in abandoned structure, removal and legal disposal of all debris, backfill and compaction, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas and all incidental work not included for payment elsewhere.

Item No. 29 – Reconstruct Sewer or Drain Structures

A. Measurement

Measurement for payment will be based on the vertical feet of sewer or drain structures reconstructed as measured and approved by the Engineer. Measurements for payment will be rounded up to the nearest 6-inches (0.5 vertical feet) of structures reconstructed as directed. Removal, reconstruction, or modification of sewer or drain structures as required to plug existing pipes, repair manholes around pipe connections, or as required in Bid Item Nos. 16, 28, 31, and 32 will not be measured for payment.

B. Payment

Payment for Item No. 29 – Reconstruct Sewer or Drain Structures shall be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to reconstruct sewer or drain structures, as indicated on the Drawings and as specified or as directed by

the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as cleaning debris from structures; trimming protruding pipe connections, saw-cutting and disposal of removed portions of sewer, drain, or water structure; removal and stockpiling the existing castings (including those currently buried); removal and reconstruction or construction of portion of existing masonry or concrete structures of various shapes and diameters as directed by Engineer, including reconstructing structures with mortared masonry block and brick courses, precast concrete rings, cones, flat tops; applying full coat of grout waterproofing sealant to the interior of all reconstructed masonry structures; removal and resetting existing castings with bricks and mortar as required and constructing concrete collars around frames to base or binder grade as directed; and all incidental work not included for payment elsewhere. Providing and delivering new or replacement (sewer or drain) manhole or catch basin castings to be set/reset will be measured for payment under Bid No. 33.

Item No. 30 – Structure Rehabilitation, Clean, Grout, Waterproof

A. Measurement

Measurement for payment will be based on the vertical feet of manhole cleaned, repaired, and sealed; as directed and as measured by the Engineer, from the lowest pipe invert (or pay limits of Bid Item No. 32) to the top of sealed area limits identified by the Engineer. The portion of manholes sealed as part of Bid Item No. 32 will not be measured for payment. Structures sealed as part of Bid Item Nos. 24 and 29 will not be measured for payment.

B. Payment

Payment for Item No. 30 – Structure Rehabilitation, Clean, Grout, Waterproof shall be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to modify and rehabilitate manholes complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as (pre and post) construction photographs, bypass flow piping or pumping; chipping and chiseling away loose mortar or defective materials; power washing and cleaning entire manhole with "Vactor" removal and legal disposal of cleanings; drilling and injecting exterior epoxy grout manhole sealant suitable for use in saltwater conditions around voids, visible leaks, and evidence of previous leaks in and around inverts, tables, shelves, pipe connections, and joints in locations as directed by Engineer; cutting and trimming pipe connections and "through pipes" as directed; application of mortar to fill voids and missing material; application of internal and external grout and sealant and waterproofing suitable for use in saltwater conditions to the limits identified by the Engineer; and all incidental work not included for payment elsewhere.

Item No. 31 – Structure Rehabilitation, Replace Frame and Cover or Grate

A. Measurement

Measurement for payment will be based on the number of new castings (complete sets of frames and covers or grates) installed on existing sewer or drain structures as directed by the Engineer, and as measured and approved by the Engineer. A frame and cover/grate set shall be measured as a single casting. Castings provided and installed to replace castings damaged by construction or as part of new or replacement manhole bid items will not be measured for payment. New frames and covers or grates installed as part of Bid Item Nos. 24 and 25 or resetting existing frames and covers or grates as part of Bid Item No. 29 will not be measured for payment. Furnishing and delivering new cast iron frames and

covers/grates will be measured for payment under Bid Item No. 33.

B. Payment

Payment for Item No. 31 – Structure Rehabilitation, Replace Frame and Cover or Grate shall be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall remove existing frames and covers and furnish, deliver, store, and protect new manhole or catch basin castings (frames and covers or grates) complete, as indicated or specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as cleaning debris from manholes; saw-cutting, removal and stockpiling the existing castings, and/or steel plates covering structures (including those currently buried), delivery of existing castings to Owner if requested, removal and reconstruction of up to 6 vertical inches of existing masonry or concrete structure as directed by Engineer, installing new castings (manholes labeled "sewer" or "drain", or catch basin grates) as directed, and constructing concrete collars around frames to base or binder grade; installation and removal of temporary pavement, installation of permanent pavement if outside of pipe trench payment width, and all incidental work not included for payment elsewhere. Reconstructing structure in addition to 6 vertical inches will be measured for payment under Bid Item No. 29.

Item No. 32 – Structure Rehabilitation, Build/Rebuild Invert and Bench

A. Measurement

Measurement for payment will be based on the number of existing manholes rehabilitated and sealed, with new or rebuilt inverts and benches, as directed by the Engineer and as measured and approved by the Engineer. Manhole rehabilitation and sealing completed as part of Bid Item No. 30 (without building or rebuilding inverts and benches) will not be measured for payment. Inverts and benches installed in new structures as part of Bid Item Nos. 24 and 25 or reconstructed as part of Item No. 29 will not be measured for payment.

B. Payment

Payment for Item No. 32 – Structure Rehabilitation, Build/Rebuild Invert and Bench shall be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to modify and rehabilitate manholes complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as (pre and post) construction photographs; bypass flow piping or pumping; removal and disposal of existing invert, bench, tables, and shelves; chipping and chiseling away loose mortar or defective materials; power washing and cleaning entire manhole with "Vactor"; drilling and injecting exterior epoxy grout manhole sealant around voids, visible leaks, and evidence of previous leaks in and around inverts, tables, shelves, pipe connections, and joints including entire manhole from the invert to 3' above the new table for brick or block manholes or to the lowest joint for pre-cast manholes; cutting and trimming "through pipes" and other pipe connections as directed; application of mortar to fill voids and missing material, build/rebuild brick and mortar invert, bench, and tables; applying internal and external grout and sealant and waterproofing from the invert to 3-feet above new table; and all incidental work not included for payment elsewhere.

Item No. 33 – Furnish and Deliver New Manhole or Catch Basin Castings

A. Measurement

Measurement for payment will be based on the number of manhole or catch basin castings (complete sets of frames and covers or grates) provided and delivered to the job

site or Owner, as directed and as measured and approved by the Engineer. A frame and cover/grate set shall be measured as a single casting. A frame and double grate set for double catch basin will be measured as two castings. Castings provided and installed to replace castings damaged by construction will not be measured for payment.

B. Payment

Payment for Item No. 33 – Furnish and Deliver New Manhole or Catch Basin Castings shall be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall provide and deliver H20 rated cast iron “Sewer” or “Drain” or “Water” manhole frames and covers or catch basin frames and grates with bituminous coating complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section’s Paragraph 1.1.B, above, as well as delivery and storage of frames and covers/grates and double catch basin grates as indicated, and re-delivery to the Owner or site of proposed installation, and all incidental work not included for payment elsewhere.

Item No. 34 – Furnish and Install Brick and Mortar Plugs, (8 to 18)-inch Diameter

A. Measurement

Measurement for payment will be based on the number of brick and mortar plugs installed in pipes or openings (8 to 18)-inch diameter or width as directed by Engineer, and as measured and approved by the Engineer. Mortar plugs installed in pipes, conduits, or structures less than 8-inches or smaller will not be measured for payment.

B. Payment

Payment for Item No. 34 – Furnish and Install Brick and Mortar Plugs, (8 to 18)-inch Diameter will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install brick and mortar plugs in pipes or structures (8-18)-inches in diameter or width complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section’s Paragraph 1.1B, above, as well as saw cutting and excavation to locate and expose pipe if required, field verification of internal and external existing pipe diameter; cutting existing pipe to be plugged if required, removal and legal disposal or removed pipe section, installing brick and mortar plugs to completely seal pipe or structure opening at least 12-inches deep into pipe or opening, fill voids in structure wall around plugged pipe if required, and all incidental work not specifically included for payment elsewhere.

Item No. 35 – Furnish and Install Brick and Mortar Plugs, Greater than 18-inch Diameter

A. Measurement

Measurement for payment will be based on the number of brick and mortar plugs installed in pipes or openings greater than 18-inches in diameter or width as directed by Engineer, and as measured and approved by the Engineer. Mortar plugs installed in pipes, conduits, or structures less than 8-inches or smaller will not be measured for payment.

B. Payment

Payment for Item No. 35 – Furnish and Install Brick and Mortar Plugs, Greater than 18-inch Diameter will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install brick and mortar plugs in pipes or structures

greater than 18-inches in diameter or width complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw cutting and excavation to locate and expose pipe if required, field verification of internal and external existing pipe diameter; cutting existing pipe to be plugged if required, removal and legal disposal or removed pipe section, installing brick and mortar plugs to completely seal pipe or structure opening at least 24-inches deep into pipe or opening, fill voids in structure wall around plugged pipe if required, and all incidental work not specifically included for payment elsewhere.

Item No. 36 – Furnish and Install 20-inch DI Water Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of 20-inch ductile iron pipe installed, disinfected, and tested complete as measured by the Engineer along the centerline of the pipe through bends, valves, and fittings.

B. Payment

Payment for Item No. 36 – Furnish and Install 20-inch DI Water Main will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 20-inch diameter ductile iron water main, complete. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; furnishing and installing pipe, restrained joints and fittings, stainless steel tie rods and clamps, bends, couplings, reducers, fittings, joints, concrete thrust blocks, and pipe bedding; cutting and disposing existing pipe, fittings, valves, and valve boxes; connecting to existing pipe; providing and installing marking tape; backfill and compaction; disinfection, flushing, bacteriological and pressure testing; removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 37 – Furnish and Install 12-inch DI Water Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of 12-inch inside diameter ductile iron pipe installed, disinfected, and tested complete as measured by the Engineer along the centerline of the pipe through bends, valves, and fittings.

B. Payment

Payment for Item No. 37 – Furnish and Install 12-inch DI Water Pipe will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 12-inch inside diameter ductile iron water main, complete. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; furnishing and installing pipe, restrained joints and fittings, stainless steel tie rods and clamps, bends, couplings, reducers, fittings, joints, concrete thrust blocks, and pipe bedding; cutting and disposing existing pipe, fittings, valves, and valve

boxes; connecting to existing pipe; providing and installing marking tape; backfill and compaction; disinfection, flushing, bacteriological and pressure testing; removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 38 – Furnish and Install (4 to 8)-inch DI Water Pipe

A. Measurement

Measurement for payment will be based on the actual linear feet of (4-8)-inch inside diameter ductile iron pipe installed, disinfected, and tested complete as measured by the Engineer along the centerline of the pipe through bends, valves, and fittings.

B. Payment

Payment for Item No. 38 – Furnish and Install (4 to 8)-inch DI Water Pipe will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install (4 to 8)-inch inside diameter ductile iron water main, complete. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; furnishing and installing pipe, restrained joints and fittings, stainless steel tie rods and clamps, bends, couplings, reducers, fittings, joints, concrete thrust blocks, and pipe bedding; cutting and disposing existing pipe, fittings, valves, and valve boxes; connecting to existing pipe; providing and installing marking tape; backfill and compaction; disinfection, flushing, bacteriological and pressure testing; removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 39 – Furnish and Install 1-Inch Copper Service Pipe

A. Measurement

Measurement for payment will be based on the actual length of 1-inch copper water service installed, disinfected, and tested complete as measured by the Engineer along the centerline of the pipe from the corporation tap on the main to the point of connection with existing water services or end cap or permanent blow-off as directed by the Engineer. Copper services replaced to address services clogged during cleaning and lining operations will not be measured for payment.

B. Payment

Payment for Item No. 39 – Furnish and Install 1-Inch Copper Service Pipe will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new 1-inch copper water services from the new water main to the existing services at the property line, complete as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; locating all existing service connections and curb boxes within the project area; shutting existing corporations immediately before connecting home to new water service

and/or replacing existing water service; saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; removal and disposal of existing water service pipe, fittings, curb stops, and curb boxes; furnishing and installing corporation tap, "wet tap" connection to water main, 1-inch copper tubing, curb stop and adjustable curb box, concrete blocking, fittings, reducers, and couplings as required; curb stop and curb box for permanent blow-off as directed; flushing new water service and connecting to existing water service at property line or as directed; cutting and disposing existing pipe, fittings, valves, and valve boxes; backfill and compaction, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, loaming and seeding, surface restoration including landscaping; and all incidental work not specifically included for payment elsewhere.

Item No. 40 – Furnish and Install City of Salem Water Meter Box

A. Measurement

Measurement for payment will be based on the actual number of City of Salem standard water meter boxes installed complete as measured by the Engineer.

B. Payment

Payment for Item No. 40 – Furnish and Install City of Salem Water Meter Box will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new water meter box, water meter, sender, piping, supports, and wiring in accordance with City of Salem and water meter box manufacturer's guidelines, complete as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with City of Salem to obtain City and manufacturer's standards, obtaining appropriately sized water meter from City of Salem, saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; removal and disposal of existing water service pipe, fittings, curb stops, and curb boxes; furnishing and installing water meter box, piping, supports and brackets, fittings, wiring, meter, and sender in box lid; backfill and compaction, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, loaming and seeding, surface restoration including landscaping; and all incidental work not specifically included for payment elsewhere.

Item No. 41 – Furnish and Install 20-inch Linestops

A. Measurement

Measurement and payment will be based on the actual number of 20-inch linestops installed complete with boxes and all appurtenances, as measured by the Engineer.

B. Payment

Payment for Item No. 41 – Furnish and Install 20-inch Linestops will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 20-inch linestops, complete as shown on plans or as directed by Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, sawcutting, excavation, disposal of sidewalk or pavement materials, supporting and/or removal and replacement of utilities in conflict with construction; cutting and disposing existing pipe, fittings, valves, and valve boxes as required; coordinating with water department to determine if shutdown can be achieved without linestop or insertion valve; field measuring existing pipe and confirming

dimensions to select appropriate size insertion valve, providing and installing insertion valve, adjustable valve boxes and covers, couplings, fittings, anchors, restraint, tie rods and clamps, concrete blocking, bedding; connecting to the new or existing pipe; disinfection, flushing, bacteriological and pressure testing; backfill and compaction, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 42 – Furnish and Install (10-12)-inch Linestops or Insertion Valves

A. Measurement

Measurement and payment will be based on the actual number of (10 to 12)-inch linestops or insertion valves installed complete with boxes and all appurtenances, as measured by the Engineer.

B. Payment

Payment for Item No. 42 – Furnish and Install 12-inch Linestops or Insertion Valves will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 10 or 12-inch linestops or insertion valves, complete as shown on plans or as directed by Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, sawcutting, excavation, disposal of sidewalk or pavement materials, supporting and/or removal and replacement of utilities in conflict with construction; exposing, supporting, and cleaning pipe and fittings; cutting and disposing existing pipe, fittings, valves, and valve boxes as required; coordinating with water department to determine if shutdown can be achieved without linestop; field measuring existing pipe and confirming dimensions to select appropriate size linestop, providing and installing, couplings, fittings, anchors, restraint, tie rods and clamps, concrete blocking, bedding; connecting to the new or existing pipe; disinfection, flushing, bacteriological and pressure testing; backfill and compaction, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 43 – Furnish and Install (6-8)-inch Linestops or Insertion Valves

A. Measurement

Measurement and payment will be based on the actual number of (6-8)-inch linestops or insertion valves installed complete with boxes and all appurtenances, as measured by the Engineer.

B. Payment

Payment for Item No. 43 – Furnish and Install (6-8)-inch Linestops or Insertion Valves will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install (6-8)-inch linestops or insertion valves, complete as shown on plans or as directed by Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, sawcutting, excavation, disposal of sidewalk or pavement materials, supporting and/or removal and replacement of utilities in conflict with construction; exposing, supporting, and cleaning pipe and fittings; cutting and disposing existing pipe, fittings, valves, and valve boxes as required; coordinating with water department to determine if shutdown can be achieved without linestop; field measuring existing pipe and confirming

dimensions to select appropriate size linestop, providing and installing, couplings, fittings, anchors, restraint, tie rods and clamps, concrete blocking, bedding; connecting to the new or existing pipe; disinfection, flushing, bacteriological and pressure testing; backfill and compaction, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 44 – Furnish and Install 20-inch Gate Valves

A. Measurement

Measurement and payment will be based on the actual number of 20-inch gate valves installed complete with boxes and all appurtenances, as measured by the Engineer.

B. Payment

Payment for Item No. 44 – Furnish and Install 20-inch Gate Valves will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 20-inch gate valves, complete. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; cutting and disposing existing pipe, fittings, valves, and valve boxes; connecting to the new or existing pipe, providing and installing concrete blocking, bedding, valve, adjustable valve boxes and covers, couplings, and fittings; anchors, restraint, stainless steel tie rods and clamps; disinfection, testing, flushing, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all work incidental thereto and all work not specifically included for payment elsewhere.

Item No. 45 – Furnish and Install 12-inch Gate Valves

A. Measurement

Measurement and payment will be based on the actual number of 12-inch gate valves installed complete with boxes and all appurtenances, as measured by the Engineer.

B. Payment

Payment for Item No. 45 – Furnish and Install 12-inch Gate Valves will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 12-inch gate valves, complete. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; cutting and disposing existing pipe, fittings, valves, and valve boxes; connecting to the new or existing pipe, providing and installing concrete blocking, bedding, valve, adjustable valve boxes and covers, couplings, and fittings; anchors, restraint, stainless steel tie rods and clamps; disinfection, testing, flushing, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all work incidental thereto and all work not specifically included for payment elsewhere.

Item No. 46 – Furnish and Install (4 to 8) -inch Gate Valves

A. Measurement

Measurement and payment will be based on the actual number of (4 to 8)-inch gate valves installed complete with boxes and all appurtenances, as measured by the Engineer.

B. Payment

Payment for Item No. 46 – Furnish and Install (4 to 8)-inch Gate Valves will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install (4 to 8)-inch gate valves, complete. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; cutting and disposing existing pipe, fittings, valves, and valve boxes; connecting to the new or existing pipe, providing and installing concrete blocking, bedding, valve, adjustable valve boxes and covers, couplings, and fittings; anchors, restraint, stainless steel tie rods and clamps; disinfection, testing, flushing, removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all work incidental thereto and all work not specifically included for payment elsewhere.

Item No. 47 – Furnish and Install New Fire Hydrants

A. Measurement

Measurement for payment will be based on the actual number of fire hydrants furnished, installed, and tested, complete as measured by the Engineer.

B. Payment

Payment for Item No. 47 – Furnish and Install New Fire Hydrants will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install new hydrants as indicated on the Drawings and directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as transporting hydrants from Water Department yard to work site, installing hydrant to align vertically with existing or proposed sidewalk and curb elevations, furnishing and installing hydrant extension kit from hydrant manufacturer if hydrant height set out of range indicated on details; furnishing and installing anchor tee, stainless steel tie rods and clamps, concrete blocking, concrete thrust block, and crushed stone with filter fabric envelope; painting and cleaning hydrant as directed, testing; and all incidental work not specifically included for payment elsewhere.

Item No. 48 – Remove and Stack Fire Hydrants

A. Measurement

Measurement for payment will be based on the actual number of fire hydrants removed, delivered, and stacked at a location requested by the Owner and as measured by the Engineer.

B. Payment

Payment for Item No. 48 – Remove and Stack Fire Hydrants will be based on the unit price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove, deliver, and stack hydrants complete as indicated on the Drawings and as

directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw-cutting pavement, excavation, removal and disposal of existing pavement and sidewalk materials; cutting, removing, and disposing existing hydrant, pipe, valve, valve box, and concrete thrust blocks or blocking; cleaning dirt and concrete from all hydrants selected by the owner for salvage, delivery and stacking of salvaged hydrant at a location directed by the Owner, disposal of hydrants not selected for salvage by the Owner, backfilling and compaction, and all incidental work not specifically included for payment elsewhere.

Item No. 49 – Furnish and Install Restrained Caps or Plugs, All Sizes

A. Measurement

Measurement and payment will be based on the actual number of restrained caps or plugs furnished and installed as indicated on plans and/or as directed and measured by the Engineer. Restrained caps installed in locations not indicated on the plans and/or as directed by the Engineer will not be measured for payment. Mortar caps and plugs will not be measured for payment.

B. Payment

Payment for Item No. 49 – Furnish and Install Restrained Caps or Plugs, All Sizes will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install restrained ductile iron caps, complete. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as well as coordination with existing utilities, notification of affected customers prior to isolation, coordinating with water department and assisting with isolation of the work area to allow connections to existing pipe; saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; installing restrained mechanical joint ductile iron caps or plugs, stainless steel tie rods and clamps, thrust blocks, friction clamps, and threaded rods, couplings, and fittings; installing concrete thrust blocks; cutting and disposing existing pipe, fittings, valves, and valve boxes; backfill and compaction; disinfection, flushing, bacteriological and pressure testing; removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 50 – Remove Existing Valve Boxes, Restore Area

A. Measurement

Measurement for payment will be based on the actual number of existing valve boxes (or water manhole and castings) removed by the Contractor complete, from the gate valve to the ground surface, as indicated on the plans outside the trench limits of payment for new or replacement water main and service work. Valve boxes removed within the trench width limit of payment and/or as required in Bid Items Nos. 36 to 49 will not be measured for payment.

B. Payment

Payment for Item No. 50 – Remove Existing Valve Boxes, Restore Area shall be based on the Unit Price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove existing valve box complete, as indicated on the Drawings and as specified or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw-cutting, excavation, removal and disposal of existing pavement or sidewalk materials; removing and disposing existing valve box (or

water manhole and castings) from gate valve to ground surface, backfill and compaction; removal and replacement of existing subbase with 6-inch minimum thickness of new gravel subbase within disturbed areas, and all incidental work not specifically included for payment elsewhere.

Item No. 51 – Install Temporary or Permanent City Conduits and Wires

A. Measurement

Measurement for payment will be based on the actual linear feet of new temporary or permanent electric or signal conduits and wiring installed complete, as measured by the Engineer along the centerline of each conduit.

B. Payment

Payment for Item No. 51 – Install Temporary or Permanent City Conduits and Wires will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new electric or signal conduits and wiring as indicated on the Drawings and as specified or as directed by the Engineer based on changing field conditions. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting and excavation to locate existing conduits or wires, coordination with City Electrical department to arrange inspections, meeting City requirements and electrical code, disconnecting existing wires in existing lights or traffic/pedestrian signals impacted by construction, saw-cutting and excavation to install conduits as directed, furnishing and installing conduits, fittings, and wires; pulling wires and connecting to existing lights or signals, installing concrete to protect conduits as required, installing detectable warning tape, and all incidental work not specifically included for payment elsewhere.

Item No. 52 – Stripping and Disposing of Existing Pavement, Sidewalk, Curb, and Subbase

A. Measurement

Measurement for payment will be based on the actual square yards of surface area stripped, rough graded, and compacted outside the trench limits of payment as shown on the plans and/or as directed and measured by the Engineer. Cutting and disposing pavement, curb, and sidewalk materials as required in other Bid Items within the trench limit of payment will not be measured for payment. Stripping and disposing materials outside the trench limit of payment to address construction damage or without prior authorization from the Engineer will not be measured for payment. Stripping and disposal of materials as part of Item No 5 - Demolition or Item No. 60 – Restoration will not be measured for payment.

B. Payment

Payment for Item No. 52 – Stripping and Disposing of Existing Pavement, Sidewalk, Curb, and Subbase will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to strip and dispose existing pavement, curb, sidewalk and pavement subbase materials; and grade and compact subgrade as shown on plans and as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as saw-cutting existing pavement and sidewalks at project limits as directed; protection of all existing castings and valve and service boxes from damage or accumulating debris, removal and replacement of castings and boxes if required, cleaning of all structures to remove construction debris; excavation, removal, hauling, and legal disposal of pavement, curbs (not measured for payment in

Bid Item 6), sidewalk, concrete, unsuitable pavement subbase and subgrade as determined by the Engineer based on review of sieve analysis testing done by Contractor as directed by the Engineer, and all soils within project limits to a minimum depth of 10-inches below existing grade; protection of existing trees and tree roots to remain within project area, protecting, supporting, and replacing overhead utilities and buried utilities, repair of any utility lines and services broken during construction; fine grading and compacting remaining subgrade subbase to meet existing grades, allowing 6-inches of new gravel subbase in all areas allowing for 3 or 4 inch pavement thickness as directed by the Engineer; installing and maintaining gravel subbase ramps to allow access to all roads and driveways, and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 53 – Provide and Install Gravel Subbase

A. Measurement

Measurement for payment will be based on the actual cubic yards of gravel subbase furnished, installed, spread, fine graded, and compacted outside the trench limits of payment and outside areas stripped (measured for payment in Item No. 55) as shown on the plans or as directed and measured by the Engineer. Furnishing, installing, spreading, and compacting gravel subbase as required in other Bid Items within the trench limit of payment will not be measured for payment. Furnishing and installing gravel subbase outside the project area without prior authorization from the Engineer will not be measured for payment. Gravel provided and installed as part of Item No 5 - Demolition or Item No. 60 - Restoration will not be measured for payment.

B. Payment

Payment for Item No. 53 – Provide and Install Gravel Subbase will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish, install, spread, grade and compact gravel subbase as shown on plans and as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as protection of all existing castings and valve and service boxes from damage or accumulating debris; removal, adjusting, and resetting castings and boxes to proposed grade as required; cleaning of all structures to remove construction debris; protection of existing trees to remain within project area, protecting, supporting, and replacing overhead utilities and buried utilities, repair of any utility lines and services broken during construction; furnishing, hauling, delivery, spreading, compaction, and compaction testing of new gravel subbase so a minimum 6-inch thickness of suitable gravel subbase as determined by the Engineer exists in all areas and 12-inch thickness of suitable gravel subbase as determined by the Engineer exists under proposed pavement; and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 54 – Furnish and Install Bituminous Concrete Curb/Berm

A. Measurement

Measurement for payment will be based on the actual length of bituminous cement concrete curb/berm installed complete as directed and as measured by the Engineer. The Contractor will not be compensated for removing and replacing bituminous curb/berm damaged during construction outside the work limits.

B. Payment

Payment for Item No. 54 – Furnish and Install Bituminous Concrete Curb/Berm will be based on the Unit Price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to replace or install bituminous concrete curb/berm, complete as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw-cutting and disposal of cut-back asphalt as required, excavation of existing soil materials, power sweeping; installation of bituminous concrete curb installed by machine with mold/shape selected by the Engineer; installation of tack coat before installation and along joint afterwards if overlay pavement is not installed afterwards; backing up curbing with gravel or loam as directed; and all incidental work not specifically included for payment under other items.

Item No. 55 – 2-inch Temporary Bituminous Concrete Pavement

A. Measurement

Measurement for payment will be based on the actual square yards of 2-inch minimum compacted thickness bituminous concrete binder course placed within the trench payment limits, curb to curb, or behind the curb line within the project area, or as directed and measured by the Engineer as directed. Temporary pavement placed outside the trench payment limits and temporary pavement placed without the direction of the Engineer will not be measured for payment.

B. Payment

Payment for Item No. 55 – 2-inch Temporary Bituminous Concrete Pavement will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install 2-inch minimum compacted thickness of temporary bituminous concrete binder course within the trench payment limits, curb to curb, or behind curb line within the project area as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw cutting pavement to create smooth edges and remove all pavement damaged by construction, removal and disposal of cut-back pavement and soil to required depth, restoring and re-grading the existing gravel base course, compaction, raising and resetting existing castings and boxes to grade, power sweeping adjacent road way and edges of pavement, power sweeping; installation of 2-inch minimum compacted thickness of temporary bituminous concrete binder course with paving machine or by hand as directed by the Engineer covering all exposed areas each week, application of emulsion to entire road surface prior to each binder course and to surface joints after paving is completed, hand placing bituminous concrete ramps to meet existing pavement surfaces for curb to curb pavement to transition to existing pavement surfaces and around manhole and catch basin castings raised to finished grade above binder as directed; replace all existing pavement markings with temporary marking paint, and all incidental work not specifically included for payment under other items.

Item No. 56 – 4-inch Permanent Bituminous Concrete Pavement

A. Measurement

Measurement for payment will be based on the actual square yards of 4-inch minimum compacted thickness permanent bituminous concrete binder course placed within the trench payment limits or as directed and measured by the Engineer.

B. Payment

Payment for Item No. 56 – 4-inch Permanent Bituminous Concrete Pavement will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install 4-inch minimum compacted thickness of permanent bituminous concrete binder course (or binder and surface course as directed) within the trench payment limits or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw cutting pavement at the project limits or at 1-foot offset to limits of temporary trench pavement to create smooth edges and removal all pavement damaged by construction; removal and disposal of cut-back pavement and temporary trench pavement and soil to required depth; restoring and re-grading the gravel base course, compaction testing; raising and resetting castings and boxes to grade; constructing exterior concrete collars surrounding masonry and frame to bottom depth of proposed binder; adjusting all valve and service boxes to proposed grades with exterior concrete collars; power sweeping, applying tack coat to saw cut pavement edges; installation of 4-inch minimum compacted thickness of bituminous concrete binder course (or binder and surface course) in two courses; application of emulsion to entire road surface prior to each binder course and to surface joints after paving is completed; replace all existing pavement markings with temporary marking paint, and all incidental work not specifically included for payment under other items.

Item No. 57 – 3-inch Permanent Hand Placed Bituminous Concrete Pavement

A. Measurement

Measurement for payment will be based on the actual tonnage of 3-inch minimum compacted thickness permanent bituminous concrete binder and/or surface course hand placed behind the curb line on driveways, aprons, ramps, walks, and elsewhere outside the trench limits of pavement as directed and approved by the Engineer based on certified weight slips and Engineers calculations to confirm yield. Temporary pavement and/or pavement that can be placed with a paving machine in the opinion of the Engineer will not be measured for payment. Pavement placed outside the project limits will not be measured for payment.

B. Payment

Payment for Item No. 57 – 3-inch Permanent Hand Placed Bituminous Concrete Pavement will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install 3-inch minimum compacted thickness of permanent bituminous concrete binder and/or surface course as directed, behind the curb line on driveways, aprons, walks, and elsewhere outside the trench limits of payment as directed and measured by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw cutting pavement at the project limits or at 1-foot offset to limits of temporary trench pavement to create smooth edges and remove all pavement damaged by construction; removal and disposal of cut-back pavement, and temporary trench pavement, and soil to required depth; restoring and re-grading the gravel base course, compaction testing; raising and resetting existing castings and boxes to grade; constructing exterior concrete collars surrounding masonry and frame to bottom depth of proposed binder; adjusting all valve and service boxes to proposed grades with exterior concrete collars; power sweeping, applying tack coat to saw cut pavement edges; installation of 3-inch minimum compacted thickness of bituminous concrete binder and/or surface course in two courses; application of emulsion to entire road surface prior to each binder course and to surface joints after paving is completed;

replace all existing pavement markings with temporary marking paint, and all incidental work not specifically included for payment under other items.

Item No. 58 – Install Cement Concrete Sidewalks

A. Measurement

Measurement for payment will be based on the actual square yards of cement concrete sidewalk installed complete and as measured by the Engineer within the trench limits of payment or areas stripped under Bid Item No. 52 as indicated on the Drawings, or as directed by the Engineer. The Contractor will not be compensated for removing and replacing concrete sidewalks damaged during construction outside the trench payment limits or outside areas indicated on the Drawings.

B. Payment

Payment for Item No. 58 – Install Cement Concrete Sidewalks will be based on the Unit Price bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to replace or install concrete sidewalks, complete as indicated on the plans or as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as saw cutting and disposal of sidewalk and pavement materials, restoring and re-grading the gravel base course, compaction; removal and resetting of existing castings and boxes to grade, saw-cutting and disposal of sidewalk and pavement materials, restoring and regarding the gravel base course; installation of minimum 4-inch minimum thickness cement concrete sidewalks, constructing concrete sidewalks in accordance with ADA requirements, finishing, expansion joints, removal and resetting of all existing appurtenances including but not limited to signs, bollards, gate boxes and castings not measured elsewhere for payment, and all incidental work not specifically included for payment under other items.

Item No. 59 – Loam and Seed

A. Measurement

Measurement for payment will be based on the actual square yards of surface area loamed and seeded within the project limits as shown on the plans or as directed and as measured by the Engineer. Loaming and seeding outside the project area and in staging or stockpile areas to repair construction damage without prior authorization from the Engineer will not be measured for payment.

B. Payment

Payment for Item No. 59 – Loam and Seed will be based on the Unit Price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install loam and seed as shown on plans and as directed by the Engineer. The work includes all items included in this Section's Paragraph 1.1B, above, as well as furnishing, hauling, and delivery of suitable top soil "loam", installing loam in all areas designated on the plans to a minimum depth of 6-inches and as directed by the Engineer; grading, compacting, and raking loam; furnishing and installing hydro-seed grass seed mixture, surrounding planted grass areas with stakes and caution tape as directed, watering and maintaining grass until growth requires second cutting as determined by the Engineer, cutting grass once to height of 2-inches, removal and disposal of stakes and caution tape; and all work incidental thereto and all work not specifically included for payment under other items.

Item No. 60 – Restoration

A. Measurement

Measurement for payment will be based on the percentage completion of each task as determined by the Engineer according to the Contractor's submitted schedule of values as approved by the Engineer.

B. Payment

Payment for Item No. 60 – Restoration shall be based on the Lump Sum Price bid for this item in the proposal. Under the Lump Sum price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete restoration within the project area, including the parking lot and public ways, as shown on Sheet C-7, and as required and directed to complete the work. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as coordinating with the City Electric Dept. regarding reinstallation and reconnection of signals, reprogramming traffic and pedestrian light sequence and timing, wiring temporary or permanent City conduits and wires as required to power lights and signals outside project area as required; raising, re-installing, reconnecting traffic, pedestrian, and sprinkler control boxes removed as part of demolition; removing pavement and surface soils as required to install loam, gravel, or pavement; furnishing and installing loam and gravel; re-installing granite curbing around traffic island; replanting and/or replacing plantings removed from traffic island including mulch as directed; removing temporary support of existing traffic light support pole and utility poles, replacement of modified traffic light support cables as required; removal and disposal of temporary bituminous curbing; blackout painting of temporary line striping and traffic arrows, painting new stripes and traffic arrows; and all restoration related and incidental work not included for payment elsewhere.

Installing bituminous concrete curb/berm will be measured for payment under Item No. 54. Installation of temporary or permanent City conduits and wires as directed will be measured under Item No. 51. Installing loam and seed outside traffic island will be measured for payment under Item No. 59.

Item No. 61 – Assist NGrid with PE Gas Pipe Installation – Excavation, Coordination, Backfill

A. Measurement

Measurement for payment will be based on the actual linear feet of new NGrid electric gas pipe trench installed complete, as measured by the Engineer along the centerline of each gas pipe between points of connection to existing gas pipes. Multiple gas pipes installed in a single trench will each be measured for payment providing adequate separation is provided in accordance with NGrid requirements.

B. Payment

Payment for Item No. 61 – Assist NGrid with PE Gas Pipe Installation – Excavation, Coordination, Backfill

will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to excavate trench for NGrid gas pipe as indicated on the Drawings and as specified or as directed by the Engineer. NGrid will provide and deliver equipment and materials required for pipe installation including pipe, fittings, valves, and warning tape. The work includes all items included in this Section's Paragraph 1.1.B, above, as well as coordination with NGrid regarding material delivery and labor/equipment scheduling; unloading, storing, and protecting delivered materials; coordinating with NGrid to schedule installation of new pipe and connections to existing pipe in

excavations prepared by Contractor, coordination with NGrid personnel and meeting NGrid requirements for depth and configuration; saw-cutting and excavation for installation of gas pipes including vacuum, blow-pipe, and hand excavation; coordinating with NGrid sub-contractor during installation and connection to existing pipes; protecting trench and work zone from vehicular and pedestrian traffic during installation and testing; installing detectable warning tape, backfill, compaction, and all incidental work not specifically included for payment elsewhere.

Item No. 62 – Install New NGrid Electric Manhole, Materials by Others

A. Measurement

Measurement for payment will be based on the actual linear number of new NGrid electric manhole structures installed complete, as approved by the Engineer and NGrid.

B. Payment

Payment for Item No. 62 – Install New NGrid Electric Manhole, Materials by Others will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new NGrid electric manhole as indicated on the Drawings and as specified or as directed by the Engineer. NGrid will provide and deliver materials required for installation including manhole structure, frame, and cover. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with NGrid regarding material delivery; unloading, storing, and protecting delivered materials; coordinating with NGrid to schedule inspections by NGrid personnel and meeting NGrid requirements for depth and configuration; saw-cutting, excavation, and temporary excavation support for installation of manhole, installing manhole with frame and cover on masonry, installing 4/0 copper ground grid with two (2) ground rods around outside of manhole, connecting new electric conduit duct bank to manhole, repairing manhole wall around penetrations as directed; backfill, compaction, and all incidental work not specifically included for payment elsewhere.

Item No. 63 – Install New NGrid Electric Conduit Duct Bank, Materials by Others

A. Measurement

Measurement for payment will be based on the actual linear feet of new NGrid electric conduit duct bank installed complete, as measured by the Engineer along the centerline of each duct bank from end caps to inside wall of structure and as approved by Engineer and NGrid. Duct banks with multiple conduits (between 3 and 16 conduits) will be measured as a single duct bank.

B. Payment

Payment for Item No. 63 – Install New NGrid Electric Conduit Duct Bank, Materials by Others will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new NGrid electric conduit duct banks as indicated on the Drawings and as specified or as directed by the Engineer. NGrid will provide and deliver materials required for installation including conduits, spacers, fittings, spacers, concrete, and warning tape. The work includes all items included in this Section's Paragraph 1.1B, above, as well as coordination with NGrid regarding material delivery; unloading, storing, and protecting delivered materials; coordinating with NGrid to schedule inspections by NGrid personnel and meeting NGrid requirements for depth and configuration; saw-cutting and excavation for installation of duct banks including vacuum, blow-pipe, and hand excavation; installing conduit duct banks with caps at

terminations and concrete encasement, extending duct bank into new electric manhole and terminating as directed, installing detectable warning tape, backfill, compaction, and all incidental work not specifically included for payment elsewhere.

END OF SECTION 01025

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.
 - 2. Administrative and supervisory personnel.
 - 3. General installation provisions.
 - 4. 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 - SUBMITTAL PROCEDURES.

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 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. Limiting Exposures: Supervise construction activities to ensure that no part of the 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.
 - 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

SECTION 01045

CUTTING, CORING AND PATCHING

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 procedural requirements for cutting, coring, rough and finish, and patching.
- B. Refer to other sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 1. Requirements of this section do not apply to mechanical and electrical installations.
- C. Demolition of selected portions of buildings or structures for alterations is specified in Section 02050 – DEMOLITION AND ALTERATION.

1.3 SUBMITTALS

- A. For informational purposes only, submit proposed cutting and patching well in advance of the time cutting and patching will be performed. Include the following information, as applicable:
 - 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching is to be performed.
 - 5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
 - 6. Where cutting and patching involves addition of reinforcement to structural elements, submit details to show how reinforcement is integrated with the original structure.
 - 7. Review by the Engineer prior to proceeding with cutting and patching does not waive the Engineer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.
 - 8. Refer to Paragraph 1.4 - Quality Assurance and submit the information specified.

1.4 QUALITY ASSURANCE

- A. No structural members shall be cut without the approval of the Engineer. No holes shall be drilled in beams or other structural members without the approval of the Engineer.
- B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
- C. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance will equal or surpass that of existing materials.
- B. Concrete and grout for rough patching shall be as specified in Division.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
 - 1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Temporary Support and Bracing: Provide temporary support and bracing of area to be cut, prior to start of cutting.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the

Project that might be exposed during cutting and patching operations.

- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.
- E. Check area during sawing operations for partial cracking and provide additional support and bracing to prevent a partial release of cut area during sawing operations.
- F Provide equipment of adequate size to remove cut panels.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
 - 2. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
 - 4. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
 - 5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
 - 6. Provide full control of slurry generated by sawing operations on both sides of wall.

7. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.

C. Coring

1. All holes cut through concrete and masonry walls, slabs or arches, structures, or pipes shall be core drilled unless otherwise approved.
2. If holes are cored through floor slabs they shall be drilled from below.
3. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.
4. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeve, equipment or mechanical seals to be installed.
5. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
6. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.
7. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050
FIELD ENGINEERING

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 includes the following:
 - 1. Examination of site and conditions of construction.
 - 2. Establishment of lines, grades, and easements.
 - 3. Connections to existing facilities.
 - 4. Restoration and protection of public and private property.
- B. Related section includes the following:
 - 1. Section 02524 – CURBS, WALKS, AND DRIVEWAYS

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. As-Built Drawings: The Contractor shall be responsible for maintaining two sets of redline "as-built locations and dimensions of work". The As-Built Drawings shall be submitted to the Owner at substantial completion of the project.
 - 2. Contractor shall insure that all subcontractors maintain and prepare As-Built drawings for their respective areas of work. Contractor shall review all subcontractor As-Built information to insure accuracy and completeness. Subcontractor's As-Built information shall be incorporated into the drawings described in Paragraph 1.3, A.1.
 - 3. As-Built drawings shall be professionally prepared. All buried utility lines and structures shall be located by a minimum of two (2) swing-ties. Ties shall be taken from permanent structure or landmark.

4. The Contractor shall submit copies of field records and record drawings each month with project invoices. Field data shall be updated each month as applicable. Failure to submit or maintain As-Built drawings shall be cause for rejection or reduction of Partial Payment requests. Payment reduction shall be as determined by the Engineer, without penalty to the Owner.

1.4 PROJECT/SITE CONDITIONS:

A. Environmental Requirements:

1. Unfavorable Construction Conditions:

- a. During unfavorable weather, wet ground, or other unsuitable construction conditions, confine operations to work which will not be affected adversely by such conditions.
- b. No portion of Work shall be constructed under conditions which adversely affect quality or efficiency thereof, unless special means or precautions are taken to perform Work in manner acceptable to the Engineer.

B. Field Measurements:

1. Lines and Grades:

- a. All Work shall be done to lines, grades, and elevations indicated on drawings or specified herein.
- b. Limited basic vertical control points have been established or designated by the Engineer. Contractor shall be responsible for establishing new vertical controls and maintaining or subsequently replacing these controls to the satisfaction of the Engineer if these controls are disturbed. The Contractor shall be responsible for establishing and verifying all vertical control information that is used.
 - (1) Points shall be used as datum for work.
 - (2) Contractor shall be responsible for transferring all lines and grades from basic survey control points.
- c. Contractor to perform all additional survey, layout, and measurement work.
- d. Contractor shall retain surveyor to field measure and record depths of existing utilities to top of pipe and invert on local datum; as well as rim elevations and depths to all pipes connecting to manholes to be modified or abandoned. Survey measurements

to be taken in conjunction with manhole entry and exploratory excavations by Contractor.

- (1) The Contractor shall provide survey work by a firm having successfully completed at least two projects of similar size and complexity within the last five years, and who shall employ experienced personnel and provide adequate supervision to satisfaction of the Engineer at all times when operations are in progress.
- (2) Surveyor shall be a registered land surveyor in the location of the project.
- 3) Surveyor shall record vertical and horizontal locations of installed utilities and prepare a record drawing of the locations for use by the Owner and Engineer.

- e. Keep the Engineer informed, in writing, two weeks in advance, of times and places at which work is to be performed, so that horizontal and vertical control points may be established and any checking deemed necessary by the Engineer may be performed.
- f. Remove and reconstruct Work which is improperly located as determined by the Engineer and at no additional cost to the Owner.

2. Easements and Rights-of-Way:

- a. Easements and rights-of-way for utilities, if required, will be provided by the Owner.
- b. Confine construction operations within limits indicated on drawings and/or within limits of easements or public ways.
- c. Place construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause least possible damage to property and interference with traffic.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use new materials in restoration of existing facilities except where soil materials and plants may be reused, as appropriate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination of Site and Verification of Conditions:

1. Before starting operations, examine site to become acquainted with conditions to be encountered.
2. Verify exact locations of sewers, water mains, gas mains, above or below ground electrical wires, other utilities, conduits and structures which may interfere with work.
3. Perform all test pit excavations prior to any pipelaying operations. No pipe trenching will be allowed within 150 feet of a designated test pit until the test pit has been excavated. Contractor shall also perform test pit excavations in locations where he feels information is required to perform the work.

3.2 APPLICATION

A. Restoration and Protection of Public and Private Property:

1. Protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by construction operations.
2. Restore all public and private property including pavement, surfacing, curbs, walks, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and landscaping to their original condition or better, whether within or outside easements.

3.4 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 01050

SECTION 01060

PERMITS AND REGULATORY REQUIREMENTS

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 RELATED SECTIONS

- A. Section 00700 – GENERAL CONDITIONS.

1.3 REGULATORY AGENCIES

- A. Contractors shall comply with all laws, rules, regulations, and ordinances promulgated by any authority having jurisdiction over the Work.
- B. The contractor shall ensure that all other necessary permits from regulatory agencies and/or inspectional authorities having jurisdiction including but not limited to electrical, plumbing, blasting, road opening, buildings, pressure vessels etc. are obtained and paid for by the Contractor or its subcontractor(s) as appropriate and or required by the State Building code at no additional cost to the Owner. If the Work or portions of the Work are not covered by the State Building Code, Contractor shall obtain a written determination from the Division of Inspection that no permit is required. Within five days of receipt of the permit or the determination that no permit is required, Contractor shall provide a copy of said permit or determination to the Engineer.
- C. Contractor to provide notification and documentation to MassDEP about asbestos cement pipe work and removal.

1.4 PERMITS OBTAINED BY THE CONTRACTOR

- A. The Contractor or its subcontractor shall be responsible for obtaining and paying for at no additional cost to the Owner, all permits, licenses, fees, certifications or approvals required for the work of this contract, not specifically listed in Section 00800 – SUPPLEMENTARY CONDITIONS. Subcontractors shall be responsible for obtaining and paying for permits applicable to their particular trades. The Contractor's responsibility includes but is not limited to building, electrical and other permits required for his equipment, work force, and of particular operations (such as transportation and storage of explosives, fuel, chemical or material storage and air emission) and the like in the performance of the work or facility construction (such as cross-connection/backflow preventers, above or below ground tanks and piping installation and/or removal and

chemical handling). Proper equipment shall be installed, tested and maintained in accordance with local, state and federal requirements.

- D. The Contractor shall be responsible for obtaining and paying for, at no additional cost to the Owner include, but not limited to, the following (as necessary):
 - 1. Local Road Opening Permit
 - 2. Local Trench Permit
 - 3. Construction Dewatering Permit if recharge discharge not suitable.
- C. The Contractor shall also be responsible for scheduling and coordinating inspections and receipt of local or state permits/approvals/certifications for any tanks, piping and associated appurtenances which are constructed, installed, tested or removed as part of this Contract. Receipt of approvals for storage and use of test chemicals/gasses will be the responsibility of the Contractor.
- D. Construction Safety: Comply with the requirements of Article 6 of Section 00700 – GENERAL CONDITIONS.
- E. Comply with all the requirements of the Massachusetts Department of Environmental Protection, including, but not limited to DEP Backflow Prevention Permits.

1.5 PERMITS OBTAINED BY THE OWNER

- A. The permits obtained by the Owner include the following:
 - 1) Request for Determination from Conservation Commission
- B. The Appendices contains the permits that the Owner shall obtain for this work. The Conservation Commission has under the authority of Massachusetts General Laws Chapter 131, Section 40, issued an Order of Conditions on the work under this contract. This Order is to become a part of the Contract Documents and the Contractor shall perform all work in strict conformance with said Order.

PART 2- PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01060

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 PRECONSTRUCTION VIDEOS AND PHOTOGRAPHS

- A. The contractor shall take video and photographic survey of entire project area prior to the beginning of construction.

1.3 SUMMARY

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

1.4 TRAFFIC CONTROL

- A. For control of moderate traffic, the Contractor shall provide an adequate number of traffic control devices employed at his own expense.
- B. Whenever and wherever traffic is sufficiently congested, public safety is endangered, or as required by authorities having jurisdiction, coordinate and arrange uniformed police officers to direct traffic and to keep traffic off the area affected by construction operations. Such officers shall be in addition to the traffic control requirements specified in other provisions of the contract.
- C. Contractor shall be responsible for obtaining No Parking signs from the City and posting them 48 hours in advance of construction.

1.5 INTERFERENCE WITH EXISTING WORKS

- A. The Contractor shall at all times conduct his operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, in cooperation with the Engineer and interested officials, 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 there from 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.

- B. The Contractor shall be aware this project will be completed simultaneously with other construction projects, therefore; contractor will be required to provide weekly updates to project schedule and timelines, attend weekly project meetings, and coordinate construction scheduling and activities to allow access to work zones and job sites for all contractors.
- C. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting his operations to meet the above requirements.

1.6 MAINTAINING FLOWS

- A. The Contractor shall plan and coordinate project to minimize service interruption to all residences, businesses and fire hydrants.
- B. The Contractor shall at his own expense, provide, maintain, and operate all temporary facilities such as dams, pumping equipment, conduits, and all other labor and equipment necessary to intercept the sewage or drainage flow before it reaches the points where it would interfere with his work, carry it past his work, and return it to the existing sewer below his work.
- C. The Contractor shall at his own cost, provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.

1.7 HYDRAULIC UPLIFT OF STRUCTURES

- A. The Contractor shall be responsible for the protection of all structures against hydraulic uplift until such structures have been accepted finally by the Owner.

1.8 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 WATER 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 sub grade under pavements.

1.9 PROTECTION AGAINST ELECTROLYSIS

- A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct

contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials.

1.10 WATERTIGHTNESS

- A. All structures, pipes, and equipment which are to contain water shall be watertight under all operating conditions for which they are intended. The Contractor shall furnish all labor, materials and equipment and do all work required by the Engineer to make all such parts of the work watertight, or to replace them if in the opinion of the Engineer any leakage is excessive. All such parts of the work filled with water for testing water tightness shall be left filled as ordered by the Engineer.

1.11 LAYOUT OF WORK

- A. The Contractor shall establish an initial "Construction Base Line" as indicated on the Drawings. Said base line shall be staked at 50 foot stations. The Engineer shall also provide bench mark information on the Drawings or separately in writing. The Contractor shall do all layout of the work from said base line and bench marks.
- B. The Contractor shall employ, at his own expense, a Registered Land Surveyor, approved by the Engineer and cause him to establish permanent bench marks during the entire progress of the work, to which easy access may be made to determine and insure all lines and grades and to verify same from time to time. The Contractor shall keep on the job a level and transit and allow the Owner's Representative and the Engineer unrestricted use of same at the work site. Such check shall not be considered as approval of the Contractor's work.
- C. The Contractor shall maintain the construction base line stakes at all times. Should stakes or marks be destroyed during the course of the work, by the Contractor or by others, the Contractor shall, at his own expense, provide the services of a Registered Land Surveyor, acceptable to the Engineer, to reestablish such stakes and marks.
- D. Contractor shall retain surveyor to field measure and record depths of existing utilities to top of pipe and invert on local datum; as well as rim elevations and depths to all pipes connecting to manholes to be modified or abandoned. Survey measurements to be taken in conjunction with manhole entry and exploratory excavations by Contractor.

1.12 CARE OF WATERCOURSES

- 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. Fire hydrants on or adjacent to the work shall be kept operational and accessible to fire-fighting equipment at all times.

END OF SECTION 01063

SECTION 01069

MASSACHUSETTS GENERAL LAWS

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 EXCERPTS FROM MASSACHUSETTS STATUTES

- A. In addition to the requirements as set forth under “Compliance with Laws” in the AGREEMENT, particular attention is directed to certain stipulations of Chapter 149 of the General Laws of Massachusetts, as amended to date as follows:

Chapter 149 – LABOR AND INDUSTRIES

Section 25	Lodging, board and trade of public employees statute part of employment contract
Section 26	Public works; preference to veterans and citizens; wages
Section 27A	Appeals from classifications and wage determinations
Section 27B	Records of employees; payroll records; statements of compliance
Section 27C	Penalties for violations of certain sections by employers, contractors, subcontractors or their employees
Section 27D	“Construction” and “constructed” defined
Section 27E	Employment of residents in highway districts
Section 27F	Wages of operators of rented equipment; agreements; penalty; civil action
Section 27G	Wages of employees of moving contractors; contracts; injunctive relief; damages
Section 27H	Wages of employees of maintenance or cleaning contractors; contracts; civil action
Section 34	Public contracts; stipulation as to hours and days of work; void contracts
Section 34A	Contracts for public works; workers’ compensation insurance; breach of contract; enforcement and violation of statute
Section 34B	Contracts for public works; wages for reserve police officer
Section 44J	Invitation to bid; notice; contents; violations; penalty

Section 25. “Every employee in public work shall lodge, board, and trade where and with whom he elects; and no person or his agents or employees under contract with the commonwealth, a county, city or town, or with a department, board, commission or officer acting therefore, for the doing of public work shall directly or indirectly require, as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person. This section shall be made a part of the contract for such employment.”

Section 26. “In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works by the commonwealth or by a country, town or district, or by persons contracting or subcontracting for such works, preference shall first be given to citizens of the commonwealth who have been residents of the commonwealth for at least six months at the commencement of their

employment who are male veterans as defined in clause Forth-third of section seven of chapter four, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the commonwealth generally who have been residents of the commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect.”

Section 27A. “Within five days from the date of the first advertisement or call for bids, two or more employers of labor, or two or more members of a labor organization, or the awarding officer or official, or five or more residents of the town or towns where the public works are to be constructed, may appeal to the commissioner or his designee from a wage determination, or a classification of employment as made by the commissioner, by serving on the commissioner a written notice to that effect. Thereupon the commissioner or his designee shall immediately hold a public hearing on the action appealed from. The commissioner or his designee shall render his decision not later than three days after the closing of the hearing. The decision of the commissioner or his designee shall be final and notice thereof shall be given forthwith to the awarding official or public body.”

Section 27B. “Every contractor, subcontractor or public body engaged in said public works project by an agency, executive office, department, board, commission, bureau, division or authority of the commonwealth or county, or municipality or any subdivision thereof to which sections twenty-seven and twenty-seven A apply shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on said works, and the hours worked by, and the wages paid to, each such employee, and shall submit weekly to the awarding authority by mail, first class postage prepaid, or by electronic mail, certified payroll records that shall consist of a complete copy of those records accompanied by a statement signed by the employer that indicates (1) the records are correct; and (2) the rate of wages paid to each performing the work of mechanic, apprentice, teamsters, chauffeurs, and laborers, and shall promptly furnish to the attorney general or his representative, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. For every week in which an apprentice is employed by a contractor, subcontractor or public body subject to this section, a photocopy of the apprentice's apprentice identification card, issued pursuant to section 11W of chapter 23, shall be attached to the records submitted under this section. Such records shall be open to inspection by any authorized representative of the department at any reasonable time, and as often as may be necessary. Every contractor and subcontractor required to keep such a record shall submit a copy of said record to the awarding authority directly on a weekly basis.

Each such contractor, subcontractor or public body shall preserve its payroll records for a period of three years from the date of completion of the contract.

Each such contractor, subcontractor or public body shall furnish to the awarding authority directly within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body or by any authorized officer or employee of the contractor, subcontractor or public body who

supervises the payment of wages, in the following form: STATEMENT OF COMPLIANCE.”

Section 27C. “(a)(1) Any employer, contractor or subcontractor, or any officer, agent, superintendent, foreman, or employee thereof, or staffing agency or work site employer who willfully violates any provision of section 26, 27, 27A, 27B, 27F, 27G, 27H, 148, 148A, 148B or 159C or section 1A, 1B or 19 of chapter 151, shall be punished by a fine of not more than \$25,000 or by imprisonment for not more than one year for a first offense, or by both such fine and imprisonment and for a subsequent willful offense a fine of not more than \$50,000, or by imprisonment for not more than two years, or by both such fine and such imprisonment.

(2) Any employer, contractor or subcontractor, or any officer, agent, superintendent, foreman or employee thereof, or staffing agency or work site employer who without a willful intent to do so, violates any provision of section 26, 27, 27A, 27B, 27F, 27G, 27H, 148, 148A, 148B or 159C or section 1A, 1B or 19 of chapter 151, shall be punished by a fine of not more than \$10,000, or by imprisonment for not more than six months for a first offense, and for a subsequent offense by a fine of not more than \$25,000 or by imprisonment for not more than one year, or by both such fine and such imprisonment. A complaint or indictment hereunder or under the provisions of the first paragraph may be sought either in the county where the work was performed or in the county where the employer, contractor, or subcontractor has a principal place of business. In the case of an employer, contractor, or subcontractor who has his principal place of business outside the commonwealth, a complaint or indictment may be sought either in the county where the work was performed or in Suffolk county.

(3) Any contractor or subcontractor convicted of willfully violating any provision of section 26, 27, 27A, 27B, 27F, 27G, 27H or 148B shall, in addition to any criminal penalty imposed, be prohibited from contracting, directly or indirectly, with the commonwealth or any of its agencies or political subdivisions for the construction of any public building or other public works, or from performing any work on the same as a contractor or subcontractor, for a period of five years from the date of such conviction. Any contractor or subcontractor convicted of violating any provision of section 26, 27, 27A, 27B, 27F, 27G, 27H or 148B shall, in addition to any criminal penalty imposed, be prohibited from contracting, directly or indirectly, with the commonwealth or any of its agencies, authorities or political subdivisions for the construction of any public building or other public works or from performing any work on the same as a contractor or subcontractor, for a period not to exceed six months from the date of such conviction for a first offense and up to three years from the date of conviction for subsequent offense. After final conviction and disposition of a violation pursuant to this paragraph in any court, the clerk of said court shall send a notice of such conviction to the attorney general, who shall publish written notice to all departments and agencies of the commonwealth which contract for public construction and to the appropriate authorities of counties, authorities, cities and towns that such person is prohibited from contracting, directly or indirectly, with the commonwealth or any of its authorities or political subdivisions for the period of time required under this paragraph. The attorney general may take such action as may be necessary to enforce the provisions of

this paragraph, and the superior court shall have jurisdiction to enjoin or invalidate any contract award made in violation of this paragraph.

(b)(1) As an alternative to initiating criminal proceedings pursuant to subsection (a), the attorney general may issue a written warning or a civil citation. For each violation, a separate citation may be issued requiring any or all of the following: that the infraction be rectified, that restitution be made to the aggrieved party, or that a civil penalty of not more than \$25,000 for each violation be paid to the commonwealth, within 21 days of the date of issuance of such citation. For the purposes of this paragraph, each failure to pay an employee the appropriate rate or prevailing rate of pay for any pay period may be deemed a separate violation, and the pay period shall be a minimum of 40 hours unless such employee has worked fewer than 40 hours during that week.

(2) Notwithstanding the foregoing, the maximum civil penalty that may be imposed upon any employer, contractor or subcontractor, who has not previously been either criminally convicted of a violation of the provisions of this chapter or chapter 151 or issued a citation hereunder, shall be no more than \$15,000, except that in instances in which the attorney general determines that the employer, contractor or subcontractor lacked specific intent to violate the provisions of this chapter or said chapter 151, the maximum civil penalty for such an employer, contractor or subcontractor who has not previously been either criminally convicted of a violation of the provisions of this chapter or said chapter 151 or issued a citation hereunder shall be not more than \$7,500. In determining the amount of any civil penalty to be assessed hereunder, said attorney general shall take into consideration previous violations of this chapter or said chapter 151 by the employer, the intent by such employer to violate the provisions of this chapter or said chapter 151, the number of employees affected by the present violation or violations, the monetary extent of the alleged violations, and the total monetary amount of the public contract or payroll involved.

(3) In the case of a citation for violating any provision of section 26, 27, 27A, 27B, 27F, 27G, 27H or 148B, the attorney general may also order that a bond in an amount necessary to rectify the infraction and to ensure compliance with sections 26 to 27H, inclusive, and with other provisions of law, be filed with said attorney general, conditioned upon payment of said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said public works to any person performing work within classifications as determined by the commissioner. Upon any failure to comply with the requirements set forth in a citation, said attorney general may order the cessation of all or the relevant portion of the work on the project site. In addition, any contractor or subcontractor failing to comply with the requirements set forth in a citation or order, shall be prohibited from contracting, directly or indirectly, with the commonwealth or any of its agencies or political subdivisions for the construction of any public building or other public works, or from performing any work on the same as a contractor or subcontractor, for a period of one year from the date of issuance of such citation or order. Any contractor or subcontractor who receives three citations or orders occurring on three different occasions, each of which includes a finding of intent, within a three year period shall automatically be debarred for a period of two years from the date of issuance of the third such citation or order or a final court order, whichever is later. Any debarment hereunder shall also apply to all affiliates of

the contractor or subcontractor, as well as any successor company or corporation that said attorney general, upon investigation, determines to not have a true independent existence apart from that of the violating contractor or subcontractor.

(4) Any person aggrieved by any citation or order issued pursuant to this subsection may appeal said citation or order by filing a notice of appeal with the attorney general and the division of administrative law appeals within ten days of the receipt of the citation or order. Any such appellant shall be granted a hearing before the division of administrative law appeals in accordance with chapter 30A. The hearing officer may affirm or if the aggrieved person demonstrates by a preponderance of evidence that the citation or order was erroneously issued, vacate, or modify the citation or order. Any person aggrieved by a decision of the hearing officer may file an appeal in the superior court pursuant to the provisions of said chapter 30A.

(5) In cases when the decision of the hearing officer of the division of administrative law appeals is to debar or suspend the employer, said suspension or debarment shall not take effect until 30 days after the issuance of such order; provided, however, that the employer shall not bid on the construction of any public work or building during the aforementioned 30 day period unless the superior court temporarily enjoins the order of debarment or suspension.

(6) If any person shall fail to comply with the requirements set forth in any order or citation issued by the attorney general hereunder, or shall fail to pay any civil penalty or restitution imposed thereby within 21 days of the date of issuance of such citation or order or within 30 days following the decision of the hearing officer if such citation or order has been appealed, excluding any time during which judicial review of the hearing officer's decision remains pending, said attorney general may apply for a criminal complaint or seek indictment for the violation of the appropriate section of this chapter.

(7) Notwithstanding the provisions of paragraph (6), if any civil penalty imposed by a citation or order issued by the attorney general remains unpaid beyond the time period specified for payment in said paragraph (6), such penalty amount and any restitution order, together with interest thereon at the rate of 18 per cent per annum, shall be a lien upon the real estate and personal property of the person who has failed to pay such penalty. Such lien shall take effect by operation of law on the day immediately following the due date for payment of such fine, and, unless dissolved by payment, shall as of said date be considered a tax due and owing to the commonwealth, which may be collected through the procedures provided for by chapter 62C. In addition to the foregoing, no officer of any corporation which has failed to pay any such penalty may incorporate or serve as an officer in any corporation which did not have a legal existence as of the date said fine became due and owing to the commonwealth.

(c) Civil and criminal penalties pursuant to this section shall apply to employers solely with respect to their wage and benefit obligations to their own employees."

Section 27D. "Wherever used in sections twenty-six to twenty-seven C, inclusive, the words "construction" and "constructed" as applied to public buildings and public works shall include additions to and alterations of public works, the installation of resilient flooring in, and the painting of, public buildings and public works; certain work done preliminary to the construction of public works, namely, soil

explorations, test borings and demolition of structures incidental to site clearance and right of way clearance; and the demolition of any building or other structure ordered by a public authority for the preservation of public health or public safety.”

Section 27E. “At least seventy-five per cent of the persons employed by the department of highways to work in connection with the construction, reconstruction, alteration or repair of any public works, in positions other than those subject to the civil service laws and rules and regulations, shall be residents in the highway district, as then established by said department or its successor in office, in which the work is being done.”

Section 27F. “No agreement of lease, rental or other arrangement, and no order or requisition under which a truck or any automotive or other vehicle or equipment is to be engaged in public works by the commonwealth or by a county, city, town or district, shall be entered into or given by any public official or public body unless said agreement, order or requisition contains a stipulation requiring prescribed rates of wages, as determined by the commissioner, to be paid to the operators of said trucks, vehicles or equipment. Any such agreement, order or requisition which does not contain said stipulation shall be invalid, and no payment shall be made thereunder. Said rates of wages shall be requested of said commissioner by said public official or public body, and shall be furnished by the commissioner in a schedule containing the classifications of jobs, and the rate of wages to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said operators.

Whoever pays less than said rates of wages, including payments to health and welfare funds, or the equivalent in wages, on said works, and whoever accepts for his own use, or for the use of any other person, as a rebate, gratuity or in any other guise, any part or portion of said wages or health and welfare funds, shall have violated this section and shall be punished or shall be subject to a civil citation or order as provided in section 27C.

An employee claiming to be aggrieved by a violation of this section may, 90 days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within 3 years after the violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief, for any damages incurred, and for any lost wages and other benefits. An employee so aggrieved who prevails in such an action shall be awarded treble damages, as liquidated damages, for any lost wages and other benefits and shall also be awarded the costs of the litigation and reasonable attorneys’ fees.”

Section 27G. “No contract for the moving of office furniture and fixtures shall be entered into or given by the commonwealth or by a county, city, town or district unless said contract contains a stipulation requiring prescribed rates of wages, as determined by the commissioner, to be paid to the employees of a moving contractor. Any such contract which does not contain said stipulation shall be invalid, and no payment shall be made thereunder. Said rates of wages shall be requested of the commissioner by the commonwealth or by a county, city, town or district, and shall be furnished by the commissioner in a schedule containing the classifications of jobs

and the rate of wages to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said employees.

An employee claiming to be aggrieved by a violation of this section may, 90 days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within 3 years after the violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief, for any damages incurred, and for any lost wages and other benefits. An employee so aggrieved who prevails in such an action shall be awarded treble damages, as liquidated damages, for any lost wages and other benefits and shall also be awarded the costs of the litigation and reasonable attorneys' fees."

Section 27H. "No agreement or contract providing for the cleaning and maintenance of public buildings or space rented by the commonwealth, shall be entered into or given by the commonwealth unless said contract or agreement contains a stipulation requiring prescribed rates of wages, as determined by the commissioners, to be paid to the employees of the maintenance or cleaning contractor. Any such contract which does not contain said stipulation shall be invalid, and no payment shall be made thereunder. Said rates of wages shall be requested of the commissioner, and shall be furnished by the commissioner in a schedule containing the classifications of jobs and rate of wages to be paid for each job. Said rates of wages shall include payments to health and welfare plans and pension plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said employees. Whoever pays less than said rates of wages, including payments to health and welfare funds and pension funds, or the equivalent in wages, on said works, and whoever accepts for his own use, or for the use of any other person as a rebate, gratuity or in any other guise, any part or portion of said wages, health and welfare funds or pension funds, shall have violated this section and shall be punished or shall be subject to a civil citation or order as provided in section 27C.

An employee claiming to be aggrieved by a violation of this section may, 90 days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within 3 years after the violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief, for any damages incurred, and for any lost wages and other benefits. Any employee so aggrieved who prevails in such an action shall be awarded treble damages, as liquidated damages, for any lost wages and other benefits and shall also be awarded the costs of the litigation and reasonable attorneys' fees."

Section 34. "Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working with the commonwealth, in the employ of the contractor, subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more

than six days in any one week, except in cases of emergency, or in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one day, except as aforesaid..."

Section 34A. "Every contract for the construction, alteration, maintenance, repair or demolition of or addition to, any public building or other public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall, before commencing performance of such contract, provide by insurance for the payment of compensation and the furnishing of other benefits under chapter one hundred and fifty-two to all persons to be employed under the contract, and that the contractor shall continue such insurance in full force and effect during the term of the contract. No officer or agent contracting in behalf of the commonwealth or any political subdivision thereof shall award such a contract until he has been furnished with sufficient proof of compliance with the aforesaid stipulations. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the officer or agent who awarded the contract at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice. Notice of cancellation sent by the party proposing cancellation by registered mail, postage prepaid, with a return receipt of the addressee requested, shall be a sufficient notice."

Section 34B. "Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers employed by him in such city or town."

Section 44J. "(1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefore shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project. Said notice shall also be published at such other times and in such other newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specifications of the proposed work may be had; the time and place of submission of general bids;

and the time and place for opening of the general bids. For contracts subject to the provisions of sections forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids. Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection.

(5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district or municipal agency. Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

(9) No request for proposals or invitation for bids issued under sections 38A1/2 to 38O, inclusive, of chapter 7, section 11C of chapter 25A, section 39M of chapter 30, this section and sections 44A to 44H, inclusive, shall be advertised if the awarding authority's cost estimate is greater than 1 year old."

B. Attention is also directed to certain stipulations of Chapter 82 as follows:

Chapter 82 – THE LAYING OUT, ALTERATION, RELOCATION AND DISCONTINUANCE
OF PUBLIC WAYS, AND SPECIFIC REPAIRS THEREON

Section 40	Jurisdiction; notice; hearings
------------	--------------------------------

Section 40. “The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:

- (1) “Company”, natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.
- (2) “Description of excavation location”, such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.
- (3) “Emergency”, a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.
- (4) “Excavation”, an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures, excluding excavation by tools manipulated only by human power for gardening purposes and use of blasting for quarrying purposes.
- (5) “Excavator”, any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.
- (6) “Premark”, to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Premarking shall not be required of any continuous excavation that is over 500 feet in length.
- (7) “Safety zone”, a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.
- (8) “Standard color-coded markings”, red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.
- (9) “System”, the underground plant damage prevention system as defined in

section 76D of chapter 164.”

C. Attention is also directed to certain stipulations of Chapter 82A as follows:

Chapter 82A – EXCAVATION AND TRENCH SAFETY

Section 1	Unattended open trenches; safety hazards; rules and regulations; fines
-----------	--

Section 1. “An excavator shall not leave an open trench unattended without first making reasonable effort to eliminate any recognized safety hazard that may exist as a result of leaving the open trench unattended. The commissioner of public safety, in conjunction with the director of labor and workforce development, or his designee, shall promulgate rules and regulations governing all construction related excavations and trench safety. The rules and regulations shall include, but not be limited to, a description of recognized safety hazards that may exist as a result of leaving open trenches or excavations unattended, a description of the procedures required or recommended by the department to eliminate safety hazards which may include covering, barricading or otherwise protecting open trenches from accidental entry, and a penalty structure for each violation of the proposed rules and regulations to be imposed by the department empowered with ensuring compliance with the rules and regulations. This penalty structure shall include the imposition of a fine for each violation of the regulations promulgated pursuant to this section. Any such fines collected by the department of public safety or the department of labor and workforce development shall be available for expenditure, without further appropriation, by those departments in an amount not to exceed \$100,000 during each fiscal year for the sole purpose of providing construction safety training for licensed operators of hoisting equipment, police department officials, fire department officials and building officials. Those departments may also charge a reasonable fee to help defray the costs associated with said training. Any monies collected from the imposition of these fines in excess of \$100,000 shall be transmitted monthly by those departments to the state treasurer who shall then deposit the excess funds into the General Fund. The department of public safety, in conjunction with the department of labor and workforce development, shall file a report detailing the amount of fines imposed, collected and expended pursuant to this section with the house and senate committees on ways and means and with the joint committee on public safety not later than August 15 of each year. The rules and regulations shall not be effective until the department of public safety has received a formal determination from the United States Secretary of Labor that the proposed rules or regulations do not seek to assume responsibility for development and enforcement therein of occupational safety and health standards relating to any occupational safety or health issue with respect to which a federal standard has already been promulgated under 29 U.S.C. section 667 or until the rules and regulations are approved by the United States Secretary of Labor as a state plan for the development of the standards and their enforcement pursuant to 29 U.S.C. section 667(c).”

D. Attention is also directed to certain stipulations of Chapter 30 as follows:

Chapter 30 – GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS,
COMMISSIONS, OFFICERS AND EMPLOYEES

Section 38A	Price adjustment clause in contracts for road, bridges, water and sewer projects awarded under Section 39M
Section 39F	Construction contracts; assignment and subrogation; subcontractor defined; enforcement of claim for direct payment; deposit, reduction of disputed amounts
Section 39G	Completion of public works; semi-final and final estimates; payments; extra work; disputed items
Section 39I	Deviations from plans and specifications
Section 39J	Public construction contracts; effect of decisions of contracting body or administrative board
Section 39L	Public construction work by foreign corporations; restrictions and reports
Section 39M	Contracts for construction and materials; manner of awarding
Section 39N	Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions
Section 39O	Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim
Section 39P	Contracts for construction and materials; awarding authority's decisions on interpretation of specifications, etc.; time limit; notice
Section 39Q	Contracts for capital facility construction; contents; annual claims report
Section 39R	Definitions contract provisions; management and financial statement; enforcement
Section 39S:	Contracts for construction; requirements

On November 20, 2013, the Massachusetts Legislature passed a bill (Chapter 150 of the Acts of 2013) requiring that water and sewer projects bid under MGL Chapter 30 Section 39M include price adjustment clauses for **fuel** (both diesel and gasoline), **liquid asphalt** and **portland cement** contained in cast in place concrete for all projects that are advertised for bid after January 1, 2014.

The inclusion of these clauses in the construction contract is the responsibility of the awarding authority, and as such, MassDEP does not dictate what language should be used in the contract. MassDEP will, however, review the contracts to verify that price adjustment clauses have been included.

Awarding Authorities may find value from researching the *price adjustment* information on the Massachusetts Department of Transportation (MassDOT) website at:

<http://www.mhd.state.ma.us/default.asp?pgid=content/fuelPrices&sid=about> .

MassDOT requires the use of price adjustment clauses in all of its contracts, and since 2008 has been requiring cities and towns utilizing Chapter 90 road construction funds to also include price adjustment clauses. Because of this, many cities and towns may already have drafted appropriate price adjustment language. This language would be suitable for use in SRF funded contracts. The MassDOT website has extensive information on price adjustments and required contract language for MassDOT contracts.

Attached below is the new Chapter 30, Section 38A language and the contract language that MassDOT uses in its construction contracts. The MassDOT contract language is presented as a possible starting point for borrowers that have not drafted price adjustment clauses. The LGU should consult with their legal and contract staff as appropriate in developing the price adjustment clauses.

Chapter 150 of the Acts of 2013
An Act Relative to Price Adjustment for Certain Materials in Construction Projects

Whereas, the deferred operation of this act would tend to defeat its purpose, which is to establish forthwith certain price adjustments, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

SECTION 1. Chapter 30 of the General Laws is hereby amended by inserting after section 38 the following section:-

Section 38A. "Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and *portland* cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent."

SECTION 2. Section 1 shall apply to projects which are advertised for bid after January 1, 2014.

Approved, November 25, 2013.

The following are MassDOT Price Adjustment Clauses - (Documents 00811, 00812, 00814)

DOCUMENT 00811
SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
ENGLISH UNITS
Revised: 02/02/2009

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

The Price Adjustment will be based on the variance in price for the liquid asphalt component only from the Base Price to the Period Price. It shall not include transportation or other charges. This Price Adjustment will occur on a monthly basis.

Base Price

The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price detailed below.

Period Price

Please note that, starting December 15, 2008, two sets of period prices will be posted each month on the MassHighway website at <http://www.mhd.state.ma.us/>. They will be labeled "New Asphalt Period Price Method" and "Old Asphalt Period Price Method".

New Asphalt Period Price Method

The "New Asphalt Period Price Method" is for contracts bid after December 15, 2008 and will show the Period Price of liquid asphalt for each monthly period as determined by MassHighway using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. MassHighway will post this Period Price on this website within two (2) business days following their receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted MassHighway the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.

Old Asphalt Period Price Method

The "Old Asphalt Period Price Method" Period Price will be for contracts bid on or before December 15, 2008 and will contain liquid asphalt prices as determined by the old or previous method. These prices will continue to be posted on MassHighway's website until all contracts using the "Old Asphalt Period Price Method" Period Price have been closed.

New and Old Asphalt Period Price Methods

The paragraphs below apply to both the New and the Old Asphalt Period Price Methods. The Contract Price of the hot mix asphalt mixture will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M3.11.03.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of tons of hot mix asphalt mixtures placed during each monthly period times the liquid asphalt content percentage times the variance in price between Base Price and Period Price of liquid asphalt.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department approved extension of time.

DOCUMENT 00812
SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE –
ENGLISH UNITS
Revised: 01/26/2009

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department's web site (www.mhd.state.ma.us) for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made\ during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS	
	Diesel	Gasoline
Excavation: and Borrow Work: Items 120, 120.1, 121, 123, 124, 125, 127, 129.3, 140, 140.1, 141, 142, 143, 144., 150, 150.1, 151 and 151.1 (Both Factors used)	0.29 Gallons / CY	0.15 Gallons / CY
Surfacing Work: All Items containing Hot Mix Asphalt	2.90 Gallons / Ton	Does Not Apply

END OF DOCUMENT 00812

DOCUMENT 00814
SPECIAL PROVISIONS
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES
January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the **Construction Economics** section of *ENR Engineering News-Record* magazine or at the ENR website <http://www.enr.com> under **Construction Economics**. The Period Price will be posted on the MassHighway website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01.

No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

END OF DOCUMENT 00814

Section 39F. “(1) Every contract awarded shall contain the following subparagraphs and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

- (a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.
- “(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.
- “(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in the payment to the general contractor for payment to the subcontractor as provided in sub-paragraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.
- “(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the

same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of amount due for each claim made by the general contractor against the subcontractor.

- “(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from any direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.
- “(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in the interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of court of competent jurisdiction.
- “(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to paragraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment for a subcontractor and out of amounts which later become payable to the general contractor and in order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.
- “(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.”

Section 39G. “Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public

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

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

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the

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

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

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

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

Section 39I. “Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating:

“(1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefore;

“(2) that the specified deviation does not materially injure the project as a whole;

“(3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and

“(4) that the deviation is in the best interest of the contracting authority. Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

“Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.”

Section 39J. “Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law.”

Section 39L. “The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works...

“(1) shall not enter into a contract for the work with, and shall not approve as a subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with the awarding authority a certificate of

the state secretary stating that the corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D, and

“(2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth.”

Section 39M. “(a) Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than ten thousand dollars, and every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, as defined by subsection one of section forty-four A of chapter one hundred and forty-nine, estimated to cost more than \$25,000 but not more than \$100,000, shall be awarded to the lowest responsible and eligible bidder on the basis of competitive bids publicly opened and read by such awarding authority forthwith upon expiration of the time for the filing thereof; provided, however, that such awarding authority may reject any and all bids, if it is in the public interest to do so. Every bid for such contract shall be accompanied by a bid deposit in the form of a bid bond, or cash, or a certified check on, or a treasurer’s or cashier’s check issued by, a responsible bank or trust company, payable to the awarding authority. The amount of such bid deposit shall be five per cent of the value of the bid. Any person submitting a bid under this section shall, on such bid, certify as follows:

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

(Name of person signing bid)

(Company)

This paragraph shall not apply to the award of any contract subject to the provisions of sections forty-four A to forty-four J, inclusive, of chapter one hundred and forty-nine and every such contract shall continue to be awarded as provided therein. In cases of extreme emergency caused by enemy attack, sabotage or other such hostile actions or resulting from an imminent security threat explosion, fire, flood, earthquake, hurricane, tornado or other such catastrophe, an awarding authority may, without competitive bids and notwithstanding any general or specific law, award contracts otherwise subject to this paragraph to perform work and to purchase or rent materials and equipment, all as may be necessary for temporary repair and restoration to service of any and all public work in order to preserve the health and safety of persons or property;

provided, that this exception shall not apply to any permanent reconstruction, alteration, remodeling or repair of any public work.

(b) "Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in writing by the awarding authority to anyone making a written request therefore, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority:

"(1) it is at least equal in quality, durability, appearance, strength and design,

"(2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and

"(3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said name or described materials."

Section 39N. "Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

"If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and if they differ substantially or materially from those shown on the plans or as indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

Section 39O. "Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety...

"(a) The awarding authority may order the general contract in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

"(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim."

Section 39P. "Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty-day period and the date by which the decision will be made."

Section 39Q. "(1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay,

suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim; the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document.”

Section 39R. “(a) The words herein shall have the meaning stated below whenever they appear in this section:

- “(1) “Contractor” means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to section thirty-nine M of chapter thirty, sections forty-four A through H, inclusive, of chapter one hundred and forty-nine and sections thirty B through thirty P, inclusive, of chapter seven.
- “(2) “Contract” means any contract awarded or executed pursuant to sections thirty B through thirty P, inclusive, of chapter seven and any contract awarded or executed pursuant to section thirty-nine M of chapter thirty, or sections forty-four A through H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.
- “(3) “Records” means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, compute printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.
- “(4) “Independent Certified Public Accountant” means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant’s independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.
- “(5) “Audit”, when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principals and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.
- “(6) “Accountant’s Report”, when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he/she has made and sets forth his/her opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall

opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefore shall be stated. An accountant's report shall include as part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

- “(7) “Management”, when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.
 - “(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principals and auditing standards.
- “(b) Subsection (a)(2) hereof notwithstanding, every agreement of contract awarded or executed pursuant to sections thirty B through thirty P, inclusive, of chapter seven, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:
- “(1) the contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and
 - “(2) until the expiration of six years after final payment, the officer of inspector general, and the deputy commissioner of capital planning and operations shall have the right to examine any books, documents, papers or records of the contractor or his/her subcontractors that directly pertain to, and involve transactions relating to, the contractor or his/her subcontractors, and
 - “(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his/her description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and
 - “(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and
 - “(5) If the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.
- “(c) Every Contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:
- “(1) transactions are executed in accordance with management's general and specific authorization;
 - “(2) transactions are recorded as necessary i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and ii. to maintain accountability for assets;
 - “(3) access to assets is permitted only in accordance with management's general or specific authorization; and
 - “(4) the recorded accountability for assets is compared with the existing assets at

reasonable intervals and appropriate action was taken with respect to any difference.

“(d) Every contractor awarded a contract shall also file in the awarding authority a statement prepared and signed by independent certified public accountant, stating that he/she has examined the statement of management on internal accounting controls, and expressing an opinion as to:

“(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management’s evaluation of the system of internal accounting controls; and

“(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant’s financial statements.

“(e) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the deputy commissioner of capital planning and operations during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The financial statement filed shall include the date of final payment. All statements shall be accompanied by an accountant’s report. Such statements shall be made available to the awarding authority upon request.

“(f) The office of inspector general, the deputy commissioner for capital planning and operations and any other awarding authority shall enforce the provisions of this section. The deputy commissioner of capital planning and operations may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor’s failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

“(g) Records and statements required to be made, kept or filed under provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).”

Section 39S. “(a) As used in this section the word “person” shall mean any natural person, joint venture, partnership corporation or other business or legal entity. Any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, alteration, remodeling or repair of any public work by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than \$10,000, and any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, estimated to cost more than \$10,000, shall certify on the bid, or contract, under penalties of perjury, as follows:

“(1) that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

“(2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

“(b) Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

“(c) The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection (b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding.”

1.3 MINIMUM WAGE RATES

- A. A schedule of minimum wage rates excerpted from that for “Mechanics, Apprentices, Teamsters, Chauffeurs, and Laborers” issued for this work by the Commissioner of Labor and Industries of Massachusetts, in accordance with Chapter 461, Acts of 1935, is included as an attachment to specification Section – 00800 – SUPPLEMENTARY CONDITIONS.

1.4 COMMONWEALTH OF MASSACHUSETTS MODIFIED SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTIDISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

- A. The Contractor shall comply with the requirements specified in the Commonwealth of Massachusetts Modified Supplemental Equal Employment Opportunity Anti-discrimination and Affirmative Action Program. A copy of these requirements is at the end of Section 00800 – SUPPLEMENTARY CONDITIONS.

1.5 LIMITATION ON ELIGIBLE CONSTRUCTION COSTS OR PAVEMENT

- A. Eligibility of temporary and permanent paving work shall conform to the Division’s regulations set forth in 314CMR 10.03(5). Payment limit lines are indicated in the measurement and payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01069

SECTION 01080

ABBREVIATIONS 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 RELATED SECTIONS:

- A. Section 01090 – REFERENCE STANDARDS.

1.3 ABBREVIATIONS:

- A. Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth opposite each. Abbreviations for trade associations and standards organizations are listed in Section 01090 – REFERENCE STANDARDS.

AASHTO American Association of State Highway and Transportation Officials

ACI American Concrete Institute

AISC American Institute of Steel Construction

ANSI American National Standards Institute

ASCE American Society of Civil Engineers

ASTM American Society for Testing and Materials

AWWA American Water Works Association

Fed. Spec. Federal Specifications issued by the Federal Supply Service of the
General Services Administration, Washington, D.C.

125-lb. ANSI American National Standard Institute for Cast-iron 250-lb. ANS
or Pipe Flanges and Flanged Fittings, Designation B16.1, for the
250 lb. ANSI Appropriate class

AWG American or Brown and Sharpe Wire Gage

NPT National Pipe Thread

OS&Y Outside screw and yoke

Stl. WG	U. S. Steel Wire, Washburn and Moen, American Steel and Wire or Roebbling Gage
USS Gage	United States Standard Gage
WOG	Water, Oil, Gas
WSP	Working steam pressure
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
IEEE	Institute of Electrical and Electronics Engineers, Inc.
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood-Preservers' Association
AWWA	American Water Works Association
CS	Commercial Standard
IBR	Institute of Boiler and Radiator Manufacturers
IPS	Iron Pipe Size
JIC	Joint Industry Conference Standards

NBS	National Bureau of Standards
NEC	National Electrical Code; latest edition
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Services Administration, Washington, D.C.
125-lb. ANSI or 250-lb. ANSI	American National Standard Institute for Cast-Iron Pipe Flanges and Flanged Fittings, Designation B16.1, for the appropriate class
AWG	American or Brown and Sharpe Wire Gage
NPT	National Pipe Thread
OS&Y	Outside screw and yoke
STL. WG	U. S. Steel Wire, Washburn and Moen, American Steel and Wire or Roebling Gage
UL	Underwriters' Laboratories
USS Gage	United States Standard Gage
WOG	Water, Oil, Gas
WSP	Working steam pressure

1.4 DEFINITIONS:

- A. Wherever the words defined in this section or pronouns used in their stead occur in the Contract Documents, they shall have the meanings herein given.
- B. General: Basic Contract definitions are included in the Conditions of the Contract.
- C. 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.

- D. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Engineer, requested by the Engineer, and similar phrases.
- E. 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.
- F. 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.
- G. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- H. 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.
- I. Provide: The term provide means to furnish and install, complete and ready for the intended use.
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 as 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.
- L. Elevation: The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the datum adopted by the Engineer.
- M. Rock: The word "rock," wherever used as the name of an excavated material or

material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding 1 cu. yd. in volume, or solid ledge rock which, in the opinion of the Engineer, requires, for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

- N. Earth: The word "earth", wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as above defined.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01080

SECTION 01090

REFERENCE STANDARDS

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 QUALITY ASSURANCE:

- A. Should specified reference standards conflict with the Contract Documents, refer to paragraph 3.3 of the General Conditions.

1.3 INDUSTRY STANDARDS (SCHEDULE OF REFERENCES):

- A. 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 attached to 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.
- B. 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 the date of Contract Documents.

AA Aluminum Association
 818 Connecticut Avenue, N.W.
 Washington, DC 20006

AABC Associated Air Balance Council
 1000 Vermont Avenue, N.W.
 Washington, DC 20005

AASHTO American Association of State Highway and Transportation Officials
 444 North Capitol Street, N.W.
 Washington, DC 20001

ACI American Concrete Institute
 Box 19150
 Reford Station
 Detroit, MI 48219

ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601
AFBMA	Antifriction Bearing Manufacturers Association 1101 Connecticut Avenue, N.W., Suite 700 Washington, DC 20036
AGA	American Gas Association
AGC	Associated General Contractors of America 1957 E Street, N.W. Washington, DC 20006
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AIA	American Institute of Architects 1735 New York Avenue, N.W. Washington, DC 20006
AISC	American Institute of Steel Construction Eighth Floor 400 North Michigan Avenue Chicago, IL 60611
AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036
AITC	American Institute of Timber Construction 333 W. Hampden Avenue Englewood, CO 80110
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
APA	American Plywood Association Box 11700 Tacoma, WA 98411

API	American Petroleum Institute 1220 L. Street, N.W. Washington, DC 2005
ARI	Air-Conditioning and Refrigeration Institute 1501 Wilson Boulevard Arlington, VA 22209
ASCE	American Society of Civil Engineers 345 E. 47th Street New York, NY 10017
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASPA	American Sod Producers Association 4415 West Harrison Street Hillside, IL 60162
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWI	Architectural Woodwork Institute 2310 South Walter Reed Drive Arlington, VA 22206
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society 550 LeJeune Road, N.W. Miami, FL 33135
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, VA 22091

CDA	Copper Development Association 57th Floor, Chrysler Building 405 Lexington Avenue New York, NY 10174
CFR	Code of Federal Regulations
CLFMI	Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue, N.W. Washington, DC 20036
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195
DHI	Door and Hardware Institute 7711 Old Springhouse Road McLean, VA 22101
EJCDC	Engineers' Joint Contract Documents Committee American Consulting Engineers Council 1015 15th Street, N.W. Washington, DC 20005
EJMA	Expansion Joint Manufacturers Association 25 North Broadway Tarrytown, NY 10591
FGMA	Flat Glass Marketing Association 3310 Harrison White Lakes Professional Building Topeka, KS 66611
FM	Factory Mutual System 1151 Boston-Providence Turnpike P.O. Box 688 Norwood, MA 02062
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WRSIS) Washington Navy Yard, Building 197 Washington, DC 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201

JIC	Joint Industrial Council c/o National Machine Tool Builders Association 79-1 Westpark Drive McLean, VA 22102
IBR	Institute of Boiler and Radiator Manufacturers a/k/a Hydronics Institute P.O. Box 218 35 Russo Place Berkeley Heights, NJ 07922
ICBO	International Conference of Building Officials 5360 S. Workman Mill Road Whittier, CA 90601
IEEE	Institute of Electrical and Electronic Engineers 345 East 47th Street New York, NY 10017
IMIAC	International Masonry Industry All-Weather Council International Masonry Institute 815 15th Street, N.W. Washington, DC 20005
MBMA	Metal Buildings Manufacturer's Association 1230 Keith Building Cleveland, OH 44115
MHD	Massachusetts Highway Department
MIL	Military Specifications Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry 127 Park Street, NE Vienna, VA 22180
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601

NAPA	National Asphalt Pavement Association 6811 Kenilworth Avenue Calvert Building, Suite 620 Riverdale, MD 20737
NCMA	National Concrete Masonry Association P.O. Box 781 Hendron, VA 22070
NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEC	National Electric Code
NEMA	National Electrical Manufacturers' Association 2101 'L' Street, N.W. Washington, DC 20037
NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, Dc 20036
NSWMA	National Solid Wastes Management Association 1730 Rhode Island Avenue, N.W. Washington, DC 20036
NTMA	National Woodwork Manufacturers Association 205 W. Touhy Avenue Park Ridge, IL 60068
OSHA	Occupational Safety Hazard Administration
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077
PCI	Prestressed Concrete Institute 201 North Wells Street Chicago, IL 60606
PS	Product Standard U.S. Department of Commerce Washington, DC 20203

RIS	Redwood Inspection Service One Lombard Street San Francisco, CA 94111
RCSHSB	Red Cedar Shingle and Handsplit Shake Bureau 515 116th Avenue Bellevue, WA 98004
SDI	Steel Deck Institute P.O. Box 9506 Canton, OH 44711
SDI	Steel Door Institute 712 Lakewood Center North 14600 Detroit Avenue Cleveland, OH 44107
SIGMA	Sealed Insulating Glass Manufacturers Association 111 East Wacker Drive Chicago, IL 60601
WSC	Water Systems Council 600 S. Federal Street, Suite 400 Chicago, IL 60605

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01090

SECTION 01105

RODENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies rodent control and general pest control requirements within project areas, and bordering areas as designated by the Engineer. This work is to be performed prior to demolition, excavation, and site preparation and throughout the Contract, so that rodents and other pests do not disperse from or infest the project area.
- B. The Contractor shall develop and implement an Integrated Pest Management (IPM) approach. As part of that approach, the Contractor shall maintain a cooperative dialogue with appropriate agencies and management/representatives of neighboring properties.
- C. The Contractor shall perform the rodent control tasks described in this Scope of Work and also respond to other pest control needs when directed by the Engineer.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS

1.3 SUBMITTALS

- A. Submit to the Engineer copies of pesticide applicator certifications and licenses within two weeks of notice to proceed.
- B. After performing the survey described in Paragraph 3.2 below and before initiating baiting, submit to the Engineer a written description of proposed pest control procedures, indicating materials, quantities, methods, and time schedule. For all pesticides to be used, submit a copy of the pesticide manufacturer's EPA-approved pesticide label with application directions.
- C. Submit to the Engineer documentation of pest control activities and results and follows:
 - 1. Weekly - Submit data sheets with locations of sites treated, amounts and types of pesticide used, number and types of traps set, survey and inspection results, sanitation conditions, complaint calls investigated, and any problem that occurred.

2. Monthly - Submit a written summary that includes determinable results of the IPM program and recommendations.
3. Quarterly - Submit a map that shows bait stations, manholes, and catch basins where rodent baits are being maintained.

1.4 QUALIFICATIONS

- A. The Contractor shall perform this work at all times in accordance with the following minimum standards and as acceptable to the Engineer.
 1. The Contractor and key personnel shall have experience with commercial and residential accounts and construction projects; have experience and technical training in vertebrate pest management and integrated pest management; have experience with various rodent control techniques, equipment, and strategies; have training and experience with insect control; and have knowledge of and experience with techniques to reduce non-target hazards.
 2. The supervisor shall be licensed and certified by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41) and Vertebrate Pest Control (category 44). The supervisor shall have specific training and experience in vertebrate pest management, commercial rodent control, general pest control, and integrated pest management.
 3. Applicators shall be licensed by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41). Applicators shall have specific training and experience in commercial rodent control and integrated pest management.

1.5 COORDINATION

- A. Perform this Work in cooperation with the other Work performed under the Contract.
- B. Initiate the work on or before field mobilization begins for the Contract and with adequate timing to achieve control before environmental disruptions. Provide a maintenance program until Contract is completed and all equipment and materials are removed.
- C. Perform the Work according to the preliminary schedule described in this section and as accepted or revised by the Engineer. Estimated durations and start dates may be changed by the Engineer to suit changes in construction schedules and field conditions. The Work could potentially require performance any day of the week and any hour of the day or night, regardless of weather.

- D. Perform this work in such a manner that toxicant or other control tools do no pose a hazard to persons, domestic animals, or non-target wildlife.

1.6 PERMITS

- A. Obtain and maintain in coordination with the Contractor appropriate permit(s) from city or state agencies for pest control activities associated with this Work.
- B. Obtain and maintain in coordination with the Contractor all right of entry permits required for the performance of this Work. This includes all utilities and private properties to which entrance is required.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Furnish and use only pesticide formulations registered by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Food and Agriculture, where appropriate according to label directions and as acceptable to the Engineer.
- B. Furnish and use devices and supplies (e.g., traps and bait stations) to facilitate the management and effectiveness of the pest control program, where appropriate and as acceptable to the Engineer.

PART 3 - EXECUTION

3.1 MEETINGS

- A. Before proceeding with the Work, all pest control personnel shall attend a Work Shop held by the Contractor and Engineer to discuss planned pest control methods and coordination.
- B. The supervisor shall meet with the Contractor and Engineer weekly to discuss pest control activities.

3.2 SURVEY

- A. Prior to baiting, survey the proposed construction area and accessible or observable bordering areas and record signs of rodent activity and sanitation conditions. Closely inspect all embankments, edge areas, and properties within and abutting the construction area. Maintain survey records in the manner described in Paragraph 3.7 below.

- B. Thoroughly inspect construction area and accessible or observable bordering areas and any nearby areas designated by the Engineer, for rodent activity and sanitation deficiencies weekly throughout the duration of this Contract and in accordance with the work schedule. Maintain inspection records in the manner described in Paragraph 3.7 below.
- C. Plan the control program and allocate resources based on survey and inspection data and as acceptable to the Engineer.

3.3 APPLICATION FOR RODENT CONTROL

- A. Apply rodenticide in strict accordance with EPA-approved label directions and the Rules and Regulations of the Massachusetts Department of Food and Agriculture. Maintain records of all bait placements in the manner described in Paragraph 3.7 below.
- B. Where appropriate, especially for surface placements of rodent baits, use properly secured and tamper-resistant bait stations consistent with EPA regulation. Individually number and properly identify all bait stations.
- C. Surface Applications

- 1. Initial Surface Baiting

- Rid the construction area of all detectable rodents before construction begins, or as acceptable to the Engineer. Bait all observable rodent burrows. Install and secure bait stations at regular and appropriate intervals and locations, and document rodent activity (burrows, droppings, bait consumed, dead rodents). Replenish bait and shift bait stations as necessary to ensure complete control of rodent populations. Bait edge and accessible bordering areas as necessary to ensure that rodents will not be dispersed by construction activities and that rodents will not infest work areas.

- 2. Maintenance Surface Baiting

- Establish a maintenance baiting program prior to mobilization by the Contractor, including construction areas and accessible bordering areas, as acceptable to the Engineer. Check bait placements weekly. Use survey and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bait and bait stations as appropriate to ensure continued control.

- D. Subsurface Applications

- 1. General

For situations involving underground construction/demolition, utility relocation, or utility construction, and for other situations when determined necessary by the Engineer, initiate subsurface baiting and rid underground environments of all detectable rodents before construction begins. Assign an identifying number to each manhole and catch basin where bait is placed so that locations of bait placements can be identified and rodent activity (droppings, bait consumed, dead rats) can be documented. Conduct bait applications during off-peak traffic hours unless otherwise directed by the Engineer. Access manholes according to the requirements of appropriate agencies and utility companies. Coordinate the Work with appropriate municipal agencies and utility companies.

2. Initial Subsurface Baiting

Apply appropriate baits to control rodent populations in manholes and catch basins. This will involve suspending and securing bait using noncorrosive wire (e.g., 24 gauge plastic coated). Place bait in all accessible manholes and catch basins within the construction work area. In addition, bait an appropriate set of manholes and catch basins in the blocks bordering the work area and as acceptable to the Engineer. Identify all baited manholes and catch basins with a standardized paint mark on the street and a numbered tag to be attached to the suspending wire. Approximately seven days after completion of the first baiting, check all manhole and catch basin baits and record estimates on the amount of bait consumed. Replenish or increase the amount of bait applied according to the amount consumed or as acceptable to the Engineer. Repeat this process again approximately fourteen days later and until there is little or no bait consumed. Check manholes and catch basins weekly when they repeatedly have 100 percent of the bait consumed.

3. Maintenance Subsurface Baiting

Prior to mobilization by the Contractor, establish a maintenance baiting program appropriate for the rodent infestation patterns identified during initial subsurface baiting. This program shall ensure continued control and shall be performed in a manner acceptable to the Engineer. Maintain bait in manholes and catch basins that have rodent activity and those that had activity during initial baitings. Check each bait according to rodent activity levels. This could range from weekly to approximately every three months, depending upon the recent history of bait consumption. Use utility maps and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute baiting locations as necessary to ensure adequate interception points for controlling immigrating rodents.

E. Cleanup

1. Remove visible rodent carcasses and dispose of them daily consistent with the pesticide label directions and applicable codes, laws, and regulations.
2. Upon completion of any pest control operations at the site, remove remaining bait and dispose of it according to the pesticide label and applicable codes, laws, and regulations. Also remove all wires used for subsurface baiting and any bait stations or traps.

3.4 SANITATION

- A. Prior to construction and throughout the duration of this Contract, identify and document harborage and food sources available to rodents on the construction site and in observable bordering areas. This includes any littering or improper or insufficient use of trash receptacles in construction areas. It also includes any bordering areas with sanitation conditions or structural deficiencies that violate City or State sanitation codes.
- B. Maintain records of sanitation conditions in the manner described in Paragraph 3.7 below.

3.5 COMPLAINT CALLS

- A. During construction, respond to pest-related complaints from the "adjacent" neighborhood (i.e. within 200 feet of the project limits) within 12 hours when directed by the Engineer. Inspect the particular premises and adjacent areas for sanitation and structural deficiencies and also signs of historic and recent pest activity. Provide sanitation and structural maintenance information to the property owner or manager. Use pesticides or traps as necessary and appropriate to resolve the complaint when there is a relationship between the pest infestation and construction activities, or when directed by the Engineer.
- B. Maintain records of all complaints investigated, including location, contact person, inspection results, and actions taken. Document the relatedness of the pest infestation to construction activities.

3.6 GENERAL PEST CONTROL

- A. When directed by the Engineer, the Contractor shall determine appropriate methods for any pest control task not specifically identified above and shall submit them in writing to the Engineer for approval in advance. Such pest control tasks would relate to unanticipated pest control needs within construction areas or adjacent areas. This could include control of insects or vertebrates other than rats and mice.
- B. Maintain records of general pest control activities and results in the manner described in Paragraph 3.7 below.

3.7 RECORD KEEPING

- A. Use standardized data sheets acceptable to the Engineer to maintain accurate records of date, placement, type, and amount of pesticides or other control tools (e.g., traps) applied. Similarly, maintain records of surveys, inspections, changes in pest activity, sanitation conditions, and complaint calls. Submit data in a format acceptable to the Engineer and as required under Paragraph 1.3 (C) above.

END OF SECTION 01105

SECTION 01108

HEALTH AND SAFETY PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Prepare a Health and Safety Plan (HASP) that meets all applicable state and federal health and safety regulations, including, but not limited to, those listed below. The Contractor shall be solely responsible for developing a HASP suitable for the Contractor's use and all work done by their subcontractors. The Owner, Engineer and/or their representative is not responsible for establishing or enforcing the health and safety requirements of the Contractor, and that nothing herein shall relieve the Contractor from its exclusive responsibility for the health and safety of its employees, and/or its representatives, and/or subcontractors.
- B. The Contractor shall be responsible for being aware of all potential hazards at the site, including asbestos cement pipe, and reviewing existing information which provides evidence of contamination within the limit of the work.
- C. The Contractor shall also be required to defend, indemnify, and hold the City of Salem, MA, and the Engineer harmless against any and all claims, liabilities, fines, or penalties arising out of actual or alleged failure of the Contractor and/or its agents, employees, or subcontractors to comply with any health or safety regulation, rule, ordinance, legislation, and/or health and safety plan.
- D. All work required in the Specifications regarding development and implementation of a HASP shall be in accordance with State hazardous waste site regulations (310 CMR 40.0018) and OSHA requirements (29 CFR 1910 and 1926). The HASP shall be submitted to the Engineer prior to site mobilization. Work shall not proceed at the site until the Engineer and the City of Salem has received a copy of the Contractor's Health and Safety Plan meeting all the requirements specified herein.
- E. The Contractor is responsible for establishing, implementing and maintaining of ambient air and dust monitoring programs and all other environmental monitoring programs. All such programs shall be operated by the Contractor whenever there are soils handling construction activities occurring at the site.
- F. The Contractor shall be responsible for providing all materials, equipment, and labor associated with applying dust control suppressants, including equipment that shall be required during all soil handling activities, in the event that fugitive dust or excessive odors are encountered.
- G. The Contractor is responsible to implement appropriate health and safety provisions to remove and dispose of asbestos cement in accordance with MassDEP regulation, requirement, and guidance documents.

1.2 DUST CONTROL

- A. During excavation of soil and fill material, dust shall be controlled to limit potential spread of contaminants and potential exposure of contaminants to workers and the public. The dust control measures implemented at the site shall be performed in accordance with Section 01560 – TEMPORARY ENVIRONMENTAL CONTROLS.

1.3 AIR MONITORING

- A. Air monitoring shall involve direct reading instruments capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for assuring that monitoring is conducted in an approved manner, that air monitoring/sampling are conducted at a frequency sufficient to ensure accurate assessments of site conditions, and that work practices, engineering controls, and/or personal protective equipment are proper for the conditions.
- B. At a minimum, detectors for organic contaminants shall be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g., excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring information. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions, and personnel protection measures.
- B. The Contractor shall keep accurate documentation of all air monitoring, which shall be made available to the Owner and Engineer for review at all times.

PART 2 - PRODUCTS

2.1 HEALTH AND SAFETY PLAN AND CERTIFICATIONS

- A. The Contractor shall, at least two weeks prior to the mobilization on the site, submit six (6) copies of its site-specific Health and Safety Plan to the Engineer. The site-specific Health and Safety Plan shall address the specific work activities to be conducted during the course of this contract and shall include, but not be limited to, the following:
 - 1. All anticipated hazards associated with the Contractor's activities (including the activities of subcontractors) based on the levels of contamination and information presented in previous studies.

2. Provisions for continually updating the Plan in accordance with any new applicable state and federal regulations or any additional information regarding conditions at the site.
3. The following information in accordance with the minimum standards set forth in 29 CFR 1910.120, 29 CFR 1910.1000, and 29 CFR 1926 and 310 CMR 40.0018:
 - 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 the Contractor's work.
 - 5) Contractor's Standard Operating Procedures including Personnel Training and Field Orientation; Personal Hygiene Requirements & Guidelines; Field Monitoring 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) List of all hazardous materials that the Contractor will have on site; the location of the Material Safety Data Sheets for each material listed and the plan for notifying all on site personnel, including but not limited to, the Engineer and/or their representatives, of the presence of hazardous materials on site. If there are no hazardous materials to be brought on site, the Contractor shall provide a written statement to the Engineer and/or their representative prior to initiating work activities certifying that the Contractor will not transport, store, or use hazardous materials on-site.
4. A certification that states the following:
 - 1) The Contractor hereby certifies that the Contractor and its employees who are engaged in work on or near the project meet the requirements of 29 CFR 1910.120, and the provisions of the American National Standards Institute Standard Z88.2 for training, medical surveillance, and respirator protection.
 - 2) The employees have received health and safety training for working in environments with known and unknown hazards;
5. The Contractor shall provide records of Health and Safety monitoring results, including PID and dust readings, and any revisions that may have been made to the plan. These records are to be provided at the weekly project progress meetings. If there are no such records for the preceding week, the Contractor shall provide a statement indicating the absence of

such readings and provide a technical justification for foregoing the specified air monitoring.

PART 3 - EXECUTION

3.1 HEALTH AND SAFETY PLAN CONTENTS, MAINTENANCE, AND IMPLEMENTATION

- A. The Contractor shall keep a copy of the HASP on site during all operations and shall conduct daily health and safety meetings. Failure to keep a copy of the HASP on site, or any other breach of the Contractor's Plan, shall be cause for stopping work at the cost of the Contractor. Delays caused by the Contractor's failure to comply with the health and safety regulations, or any health and safety plan, shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are implemented.
- B. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's safety and health program for personnel working on the site shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer.
- C. The Contractor shall make available Level C personal protective equipment and clothing, not including respirators, to the Engineer and/or their representative for use during site inspections by the Engineer and/or their representative, up to a maximum of three (3) complete sets per day. 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). The Contractor shall provide a repository for collection of disposed health and safety materials. Collection and disposal of contaminated expendable supplies shall be the Contractor's responsibility.
- D. The level of dermal and respiratory protection shall be determined based upon continuous air monitoring to be performed by the Contractor. The Engineer may conduct duplicate air monitoring for quality control purposes. As air monitoring indicates the levels of contaminants in the air, the personal protective equipment shall be determined based upon established standards and the standards set forth in the Contractor's Health and Safety Plan. Regardless, modified Level D protection for all on-site personnel is the minimum project requirement.
- E. The Contractor shall be aware of site-specific requirements, such as site security during non-working hours, limited work space, and minimizing the effects of soil excavation, in preparing its health and safety program.

3.2 ROUTINE SAFETY MEETINGS

- A. The Contractor shall keep a copy of the HASP on site during all operations, and shall conduct routine health and safety meetings to ensure that all work is being performed in accordance with OSHA regulations, the Contractor's HASP, and prior to initiating a new task, following an incident or following any changes to the HASP necessitated by site conditions. Failure to conduct routine safety meetings may be cause for stopping work at the cost of the Contractor.

END OF SECTION 01108

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

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. 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 environmental 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. 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.

Specific requirements for erosion and sedimentation controls are specified in Section 01568 – EROSION CONTROL, SEDIMENTATION AND CONTAMINATION OF CONSTRUCTION MATERIALS.

- D. 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.

- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Massachusetts Department of Environmental Protection and local Conservation Commission.
- F. Schedule and conduct all work in a manner that will minimize the level of noise escaping the site, especially at night and on weekends.

1.3 APPLICABLE REGULATIONS:

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

1.4 NOTIFICATIONS:

- A. The Engineer will notify the Contractor in writing of any observed 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 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.

1.5 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 (NOT USED)

PART 3 - EXECUTION

3.1 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 will

appear 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.

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.

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.

- E. The locations of the Contractor's storage, and other construction building, 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.
- F. 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 described in Section 01568, or as approved by the Engineer.

- G. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.
- H. At a minimum, the Contractor shall maintain on-site absorbent pads, booms and absorbent materials sufficient to address a release of fuel oil, hydraulic oil or any other hazardous materials that the Contractor intends to use or store on site, including fuel oil and hydraulic oil that is used within earth moving equipment. The quantity of spill containment materials maintained on site shall be sufficient to respond to a catastrophic release from the vessel containing the greatest quantity of oil or hazardous material on-site. The Spill and Discharge Plan shall indicate the location and quantity of the materials to be staged on site and the basis for the quantities (i.e. indicate the vessel which will be on site containing the greatest volume of oil or hazardous materials). No fuel or oil tanks or drums may be temporarily staged on site unless they are stored within a secondary containment system. Fuel deliveries must be performed in a designated which has either secondary containment or upon an impervious surface with absorbent berms located around the point of fuel delivery. The Spill and Discharge Plan shall indicate the location of the fueling area and the nature of secondary containment which the Contractor intends on utilizing.

3.2 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, embankments, 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 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.

3.3 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 controlling the particular pollutant are being carried out or until the material concerned has become controlled to the extent that pollution is no longer being created, spread or exacerbated.

3.4 NOISE CONTROL:

- A. The Contractor shall make every effort to minimize noises caused by his operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with State and Federal (OSHA) regulations and local ordinances.

3.5 DUST CONTROL

- A. Nuisance dust levels may be encountered during excavation, backfilling or regarding activities. Dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.
- B. Areas to be excavated shall be lightly sprayed with water before excavation. Additional water spray may be utilized only when any indication of excessive dust is observed. The Contractor shall minimize the use of water within the limits of excavation.
- C. Access roads shall be sprayed with water on a regular basis to minimize the generation of dust.
- D. All containers temporarily storing waste material shall be covered at all times except as necessary to place waste material into the container. The Contractor shall inspect the covers daily to ensure the covers are in place and effectively eliminating the generation of dust and make appropriate notes in the site log.
- E. All stockpiles of soil and loose granular construction materials shall be covered at the end of the day with a polyethylene sheeting, a minimum of 6-mil-thick, so as to eliminate the generation of dust. The Contractor is responsible for inspecting the covers daily to ensure the covers are in place and effectively eliminating the generation of dust. Water shall not be used on stockpiles to reduce the generation of dust.

3.6 CONTAMINATED LIQUIDS

- A. The Contractor shall collect and properly dispose of contaminated liquids and other liquids generated or encountered on site during construction.

3.7 BACKFILLING AND COMPACTION

- A. Excavated areas shall be backfilled with appropriate backfill material (including excavated material suitable for reuse and, when necessary, imported off-site material). Any off-site backfill used in excavated areas shall be in accordance with these specifications, and which has been tested and certified as free of contaminants as specified in 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING. In order to minimize the volume of imported clean fill used on the site the Contractor shall use on-site soil/fill to the maximum extent possible which has been determined suitable for reuse by sieve analysis or visual inspection as approved by the Engineer.

END OF SECTION 01110

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 PRECONSTRUCTION CONFERENCE

- A. A preconstruction 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 preconstruction conference will be held.

1.3 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 four times 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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01210

GENERAL REQUIREMENTS FOR UTILITY WORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies general requirements for construction, protection, support, maintenance, and restoration for underground and overhead utilities affected by construction of the Project. The Work includes new construction, reconstruction, relocation, and abandonment.
- B. The utility works and services that may be affected include, but are not limited to:
 - 1. Storm drain, sanitary sewer
 - 2. Water distribution
 - 3. Gas distribution (high and low pressure)
 - 4. Electric transmission
 - 5. Electric distribution
 - 6. Street lighting
 - 7. Telephone
 - 8. Cable Television
 - 9. Signal communication
 - 10. City fire signals
- C. This Section shall be used in conjunction with the specific underground utility work sections that apply to the Contract.

1.2 WORK BY UTILITY COMPANIES

- A. Certain parts of the utility work shall be performed, where shown or specified, by the utility company.
- B. Contact the utility companies in advance of construction to allow sufficient time for the utility companies to accomplish the work they are required to perform. Provide the utility company at least thirty (30) days advance notice of scheduled date for commencement of work by the utility company.
- C. Work performed by utility company as part of the Work of this Contract, and other work performed by utility company solely for the Contractor's convenience, shall be at no additional cost to the Owner.

1.3 DEFINITIONS

- A. Abandoned means that use has been discontinued by the utility company.

- B. To be abandoned means that use will be discontinued as part of the Work of this Contract.
- C. Maintenance means providing continuous and satisfactory service during construction.
- D. Maintain complete-in-place means to protect, support, and otherwise maintain the existing condition and function of a facility during construction.
- E. Restoration means replacement of a facility or portions of a facility that have been removed or made inoperative by the Contractor in the performance of the Work.
- F. Utility Company means the company, agency, owner, or operator of the facility concerned.
- G. Temporary Facility means a facility provided, in lieu of an existing or new facility, to ensure continuity of service. When a temporary facility is not shown on the Contract Drawings, but is provided for the convenience of the Contractor, it shall be constructed at no additional cost to the Owner.

1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTALS
 - 1. Submit working drawings and, if applicable, shop drawings showing the details, procedures, and scheduling for performance of the utility work. Show actual verified field locations of existing utility facilities that are affected by the Work of this Contract; interferences which these facilities present to the new work; location of settlement markers; method proposed to proceed with the construction; and, if applicable, method of testing and procedure for restoration.
 - 2. Submit to the Engineer specifications and drawings describing the method to be used to temporarily support existing utilities during construction. Include working drawings that indicate proposed materials and details.
 - 3. Submit to the Engineer materials data required by specification. Also submit certifications that the products to be incorporated in the Work are in conformance with utility company requirements.
 - 4. Submit to the Engineer for review a detailed excavation procedure for subsurface utilities. At a minimum, the procedure shall include:
 - a. Equipment to be used for anticipated subsurface utility investigation and excavation.
 - b. Personnel to be used and designated utility coordinator.

- c. Duration and schedule of investigation and excavation.
 - d. Techniques proposed to isolate and protect existing utilities.
 - e. Method for the Contractor to provide utility information derived from subsurface investigation to field personnel doing excavation.
 - f. A disciplinary plan that delineates all steps to be taken as a result of a utility disruption, including possible removal of Contractor's individuals from the site.
- B. Submit an emergency action plan outlining procedures to be followed by the Contractor in case of unplanned utility interruptions or unplanned damage to utilities in service. Obtain concurrence from each affected utility company.
- 1. List Contractor's personnel assigned responsible charge for emergency action on site for each shift, and those on call.
 - 2. List phone notification numbers for each utility company, fire, and police departments, and other relevant agencies.
 - 3. Include copies of utility plans showing the valve or switch locations to isolate each line.
- C. Transmit to the Engineer the as-built utility location survey data as specified in Article 3.11 of this Section.

1.5 APPROVAL BY UTILITY COMPANIES

- A. All personnel performing work on utility facilities shall be fully qualified and able to meet the standards of the affected utility company. If the Contractor does not have the required utility experience, Contractor shall retain a specialist firm acceptable to the affected utility company to perform the Work.
- B. Prior acceptance of temporary support methods for each affected utility facility shall be obtained by the Contractor from each utility company concerned.
- C. Prior permission for disrupting a utility shall be obtained by the Contractor from each utility company concerned.
- D. Prior approval for disrupting fire signal lines, high pressure fire water mains and hydrants, and fire service lines shall be obtained from the City of Salem Fire Department.

1.6 NOTIFICATION

- A. Notify the appropriate utility companies and the Engineer at least seven (7) days prior to starting any work involving or adjacent to surface, subsurface, or overhead utility facilities. If cut-off or connection is expected, notify the appropriate gas company Engineering Department four (4) weeks prior to cut-off or connection to gas main.
- B. Immediately notify the Gas Company Engineering Department if surface or subsurface settlement or movement in excess of the design amount is observed, regardless of the proximity to an existing gas facility.

1.7 STANDARD SPECIFICATIONS OF UTILITY OWNERS

- A. Specifications and construction methods from each utility owner apply to individual utility specification sections.
- B. It is the Contractor's responsibility to ensure that, unless otherwise specified, the standards for materials and construction methods required by the utility owner are met.

PART 2 - MATERIALS

2.1 GENERAL

- A. Materials for temporary and permanent work shall be of the type, grade, and class specified by reference to utility company standards.
- B. Materials salvaged during construction that are indicated to be reused are subject to inspection and acceptance by the respective utility companies and the Engineer. Salvaged material not reused or claimed by the utility company shall become the property of the Contractor and must be disposed by the Contractor.

PART 3 - EXECUTION

3.1 GENERAL CONSTRUCTION REQUIREMENTS

- A. Unless otherwise noted, conform to the construction standards, specifications, and standard practices of the affected utility companies. Coordinate with each utility company the work to be done by the Contractor and the work to be done by utility company. Ensure continuity of all existing utility services to all users, except when the utility company determines that temporary interruption is acceptable.
- B. Unless otherwise indicated, maintain all utility facilities complete in place. Provide temporary support of utilities during construction only by methods acceptable to the utility company concerned.

- C. Provide and maintain all temporary facilities required to provide interim utility service when a utility facility is to be relocated and when a utility facility to be replaced is abandoned prior to replacement.
- D. Where an existing utility facility is encountered that is not indicated, or that is determined to be a different utility service than that indicated, promptly notify the Engineer, who will assist in determining the owner of the facility and the disposition of the facility.
- E. All water, sanitary, and storm services must be maintained throughout the project through the use of temporary pumps and piping. Unless otherwise noted, no service interruptions will be permitted.
- F. No water service interruptions will be permitted unless the Contractor provides the Salem Water Department 72 hour (3 day) notice excluding weekend days.

3.2 UNSAFE AND UNSUITABLE UTILITY STRUCTURES

- A. If, upon exposure, the condition of a facility to be maintained complete-in-place is found to be unsafe by the Engineer and the utility company for support or for maintenance of service, replace or reconstruct the facility as authorized by the Engineer, under the provisions for Changes in the Work.

3.3 ABANDONED FACILITIES

- A. Demolish and remove abandoned utility facilities located within areas of the Work of this Contract. Abandoned facilities that do not interfere with the Work of this Contract may remain.
- B. Do not undertake demolition or removal until written permission for such Work has been obtained from the utility company.
- C. When abandoned facilities are to be left in place, plug or cap the ends of conduits and pipes, and fill with concrete fill unless otherwise indicated. Remove abandoned utility manholes, junction boxes, and similar structures to a minimum depth of 4 feet below finish grade, and puncture or break the bottom slabs of manholes and similar structure to allow drainage. Backfill and compact excavations resulting from removal of utility facilities as required to restore original grade.

3.4 SETTLEMENT OR MOVEMENT

- A. In case of settlement or other movement that causes or could cause damage, take immediate remedial measures to correct the conditions and repair the damage.

3.5 ACCESS

- A. At all times permit free and clear access to the affected facilities by personnel of the utility companies.
- B. Throughout the construction period, maintain access to all utility vaults and structures.

3.6 SERVICE CONNECTIONS

- A. Work required for maintaining, supporting, relocating, restoring, and constructing all service connections is included as part of the Work of this Contract, even though some existing service connections, for which record information is not available, may not be shown on the Contract Drawings.

3.7 REPAIR AND RESTORATION

- A. Repair all damage to utilities caused by Work of this Contract. Clean all utility structures of dirt caused by Work of this Contract. Immediately notify the Engineer and the utility company of damage to utilities.
- B. Replacement of pavements, walks, and curbs is not part of the Work of a utilities Section, except when damage beyond the extent of the utility work zone is caused by utility Work.

3.8 EXCAVATION AND BACKFILL

- A. Perform excavation and backfill in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING. Perform excavation support, groundwater control, and erosion and sedimentation control in connection with utility work in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

3.9 CLEANING UP

- A. In accordance with Section 02498 – RESTORATION OF DISTURBED AREAS, the Contractor shall, upon completion of the Work, remove all temporary construction facilities, equipment, debris, and unused materials, and put the project area and adjacent affected areas in a neat and clean condition.

3.10 AS-BUILT UTILITY LOCATION SURVEY

- A. For each new or relocated utility installed perform an as-built location survey prior to backfilling the excavation.
- B. Where existing street curb lines will remain as they are, provide as-built utility locations by measurement from the edge of street curb.

- C. Where final curb lines are not available at the time of utility installation, provide as-built utility locations by coordinates.
- D. For each utility, make the necessary calculations, prepare a separate sketch, certify the field notes and sketch, and transmit them to the Engineer as utility is completed.

END OF SECTION 01210

SECTION 01300

SUBMITTAL PROCEDURES

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 the general methods and requirements of submissions applicable to the following work-related submittals.
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Samples
 - 4. Mock Ups
 - 5. Operation and Maintenance Manuals
 - 6. Construction or Submittal Schedules
 - 7. Or equal submittals
 - 8. Schedule of Values
 - 9. Technical Memos
- B. Detailed submittal requirements will be specified in the technical specifications section.

1.3 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 of concrete reinforcement, structural details and piping layout, schedule information, setting diagrams, actual shop work 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 works.
 - 2. All shop and working drawings shall be prepared on standard size, 24-in. by 36-in. sheets, except those which are made by changing existing standard shop or working drawings.

3. All shop drawings shall be submitted using a transmittal form approved by the Engineer. Submittal form shall include identification of transmittal number and specification section number.
4. All shop drawings submitted by subcontractors for review shall be sent directly to the Contractor for approval. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
5. The Contractor shall check all subcontractor's 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.
6. All details on shop drawings submitted for approval shall show clearly the relation of the various parts of 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.

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 printed installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances including certificates of compliance 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 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.

1.4 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 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 Engineer a copy of each submittal transmittal form for shop drawings, product data and samples at the time of submittal of said drawings, product data and samples to the Engineer.
 - 1. Submittals received "WITHOUT" Certification Statement shall not be reviewed.
- C. If a shop drawing shows any deviation from the requirements of the Contract Documents, the Contractor shall make specific mention of the deviations in the Transmittal Form furnished by the Engineer and provide a description of the deviations in a letter attached to the submittal.
 - 1. Submittals received "WITHOUT" description of the deviations in a letter attached to the submittal shall not be reviewed.
- D. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his 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 not have responsibility.
- E. No portion of the work requiring a shop drawing, work plan, technical memo, 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.

- F. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.
- G. Manufacturer's printed installation instructions, a part of product data submitted to the Engineer will not be reviewed and are for informational purposes only.

1.5 "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 the cost savings will be prepared and the contract price modified.

1.6 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. All complete submittals shall be submitted sufficiently in advance of construction requirements to provide no less than fifteen (15) days, excluding Saturdays, Sundays and legal holidays for review from the time received at the Engineer's reviewing office. For submittals of major equipment, that require more than fifteen (15) days to review, due to its complexity and amount of detail and also requiring review by more than one engineering discipline, a letter will be sent by the Project Manager or his/her designee to the Contractor informing him/her of the circumstances and the date it is expected the submittal will be returned to the Contractor.
- C. Number of submittals required:
 - 1. Shop Drawings: Unless otherwise stated in the respective Specifications Sections, submit six (6) copies.

2. Product Data: Unless otherwise stated in the respective Specifications submit six (6) copies.
3. Samples: Submit the number stated in the respective Specification Sections.
4. Schedule of Values: Submit six (6) copies.

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:
 - 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 re-submittals.
11. An 8-in. x 3-in. blank space for Contractor and Engineer stamps.

- E. Each shipment of drawings shall be accompanied by a transmittal form furnished by the Engineer giving a list of the drawing numbers and the names mentioned above.

1.7 CONTRACTORS COST BREAKDOWN

- A. The Contractor shall submit a Schedule of values in accordance with the requirements to Section 01370 – SCHEDULE OF VALUES.

1.8 CONTRACTOR WORK PLANS and TECHNICAL MEMOS

- A. The Contractor shall submit a work plan for each significant phase of mainline and on-lot construction associated with the work including, but not limited to, the following:
- i. Staging Area Protection, Equipment, Materials
 - ii. Traffic and Pedestrian Management, Safety, Signage
 - iii. Demolition
 - iv. Pavement Cutting and Removal
 - v. Tree Protection or Removal
 - vi. Trench Dewatering, Erosion and Sedimentation
 - vii. Bypass Pumping and Piping for Sewer and Drain
 - viii. Support of Excavation
 - ix. Sewer and Drain Replacement and Installation
 - x. Gas and Electric Utility Installation and Coordination
 - xi. Water Main Replacement and Installation
 - xii. Disinfection and Pressure Testing
 - xiii. Rock/Ledge Removal
 - xiv. Backfill, Compaction, Testing
 - xv. Restoration
 - xvi. Stripping, Grading, Paving
 - xvii. Coordination with Work by Other Utilities
- B. The Contractor shall not enter onto private property without giving the Engineer at least ten (10) days advance notice in writing. The Contractor shall notify the Engineer and the owner of the property 10 days in advance before any excavation is performed on private property.
- C. The work plans shall include, but may not be limited to, the following information to accurately describe the proposed work:
- i. Scope of work
 - ii. Schedule of work
 - iii. Proposed Manpower
 - iv. Proposed Equipment
 - v. Back-up Equipment
 - vi. Staging Area
 - vii. Soil Management
 - viii. Dewatering Requirements
 - ix. Maintenance of Vehicular Traffic
 - x. Maintenance of Pedestrian Traffic
 - xi. Maintenance of Emergency Vehicular Traffic
 - xii. Notification of Residents/Businesses
 - xiii. Erosion and Sedimentation Controls
- D. The work plans shall be submitted to the Owner for review at a minimum of ten (10) working days prior to starting a particular phase of construction. The work shall not proceed without the Owners authorization.

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

A. The Engineer's review is for general conformance with the design concept and contract drawings. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract plans and specifications or from departures therefrom. 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.

B. The review of shop drawings, data, and samples will be general. 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.

C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which the 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. Two (maximum) copies of shop drawings or product data will be returned to the Contractor. Samples will not be returned.

E. Submittals will be returned to the Contractor under one of the action codes indicated and defined on the transmittal form furnished by the Engineer.

F. Re-submittals will be handled in the same manner as first submittals. On re-submittals 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.

G. 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 option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

H. 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.

I. 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.

1.10 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 re-submittal (if required), coordination with other submittals, inspection, testing (off-site and on-site), 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.

2.0 CERTIFICATION FORMS

A. If specifically specified in other sections of these Specifications, the Contractor shall submit the applicable certification form for each item required, and in the form attached to this section, completely filled in and stamped.

2.1 CERTIFICATES OF COMPLIANCE

A. Certificates of Compliance specified in the specifications shall include and mean certificates, manufacturer's certificates, certifications, certified copies, letters of certification and certificate of materials.

B. The Contractor shall be responsible for providing Certificates of Compliance requested and specified in the technical specifications. Certificates are required for demonstrating proof of compliance with specification requirements and shall be executed in 6 copies unless otherwise specified. Each certificate shall be signed by an official authorized to certify on behalf of the manufacturing company and shall contain the name and address of the Supplier, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Supplier from furnishing satisfactory material, if after tests are performed on selected samples, the material is found not to meet the specific requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

CERTIFICATE OF DESIGN

The undersigned hereby certifies that he/she is a Professional Engineer registered in the state of Massachusetts and that he/she has been employed by (Name of Contractor)

_____ to design _____ in accordance with Specifications Section _____ for the WASHINGTON STREET AND DODGE STREET UTILITY REPLACEMENT PROJECT. The undersigned further certifies that he/she has performed similar designs previously and has performed the design of the _____; that said design is in conformance with all applicable local, state, and federal codes, rules, and regulations and professional practice standards; that his/her signature and Professional Engineer (P.E.) Stamp have been affixed to all calculations and drawings used in, and resulting from, the design; and that the use of that stamp signifies the responsibility of the undersigned for that design.

The undersigned hereby certifies that he/she has Professional Liability Insurance or will be covered by an Employer Policy with limits of \$1,000,000.00 and a Certificate of Insurance is attached.

The undersigned hereby agrees to make all original design drawings and calculations available to the City of Salem or Owner's representative with seven (7) days following written request therefore by the Owner.

P.E. Name

Contractor's Name

Signature

Signature

Title

Title

Address

Address

END OF SECTION 01300

SECTION 01310

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.

1.2 SUMMARY

- A. CONTRACTOR shall prepare and submit to ENGINEER for review within 14 days after Notice to Proceed, a construction progress schedule.
- B. Normal working hours shall be 7:00 A.M. to 4:00 P.M. Monday through Friday excluding legal holidays. Excessive noise and neighbor complaints could necessitate a reduction in work hours allowed. The contractor shall work in consideration of their noise, their neighborhood impact, and be responsive to noise complaints. The contractor shall be permitted to work evening hours where required by Contract and/or weekends upon a written request to the Engineer and Owner a minimum of 48 hours in advance and written approval from the Owner is required.
- C. Night work may be established by CONTRACTOR as regular procedure with written permission of OWNER. Such permission, however, may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for proper prosecution and control of work at night.

1.3 FORM OF SCHEDULES

- A. Prepare schedules in form of a horizontal bar chart.
 - 1. Provide separate horizontal bar for each trade or operation.
 - 2. Horizontal time Scale: Identify first work date of each week.
 - 3. Scale and spacing to allow space for notations and future revisions.
- B. Format of Listings: Chronological order of start of each item of work.
- C. Identification of Listings: By major specification section numbers.

1.4 CONTENT OF SCHEDULES

A. Construction Progress Schedule:

1. Show complete sequence of construction by activity.
2. Show dates for beginning and completion of each major element of construction and installation dates for major terms of equipment. Elements shall include, but not limited to, the following:
 - a. Work plan submitted to Engineer
 - b. Shop drawing receipt from supplier/manufacturer submitted to ENGINEER, review and return to supplier/manufacturer
 - c. Material and equipment order, manufacturer and delivery
 - d. Demolition
 - e. Bypass Pumping
 - f. Traffic and Pedestrian Management
 - g. Sewer and drain installation
 - h. Connection to existing sewers and drains
 - i. Water main installation
 - j. Performance and Leakage Testing
 - k. Connection to existing water mains
 - l. Disinfection and Testing
 - m. Subcontractor's items of work
 - n. Installation of Gas and Electric Utilities and Coordination
 - o. Allowance for Inclement Weather
 - p. Soil Hauling and Disposal
 - q. Temporary and Final Paving
 - r. Restoration
 - s. Final cleanup
3. Show projected percentage of completion for each item as of first day of each month.

1.5 SCHEDULE REVISIONS

- A. Every 7 days CONTRACTOR shall revise construction schedule to reflect changes in progress of work.
- B. Indicate progress of each activity at date of submittal.
- C. Show changes occurring since previous submittal of schedule.
 1. Major changes in scope.
 2. Activities modified since previous submittal.
 3. Revised projects of progress and completion.

4. Other identifiable changes.

D. Provide a narrative report as needed to define.

1. Problem areas, anticipated delays, and impact on schedule.

2. Corrective action recommended and its effect.

3. Effect of changes on schedules of other CONTRACTORS.

1.6 SUBMITTAL REQUIREMENTS

A. For initial submittal of construction schedule and subsequent revisions thereof, furnish six (6) copies of schedule to ENGINEER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01310

SECTION 01346

AS-BUILT DRAWINGS

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 includes the following:

- 1. As-Built Drawings:

- a. The Contractor shall maintain and keep a record copy of as-built drawings. The drawings shall show all materials as installed. For utility projects, a minimum of two (2) swingties to permanent structures shall be shown for all fittings, valves, corporation stops, sewer services and any other item which will be backfilled upon completion of the work. As-built drawings shall be kept current and will be reviewed monthly. Failure to maintain current as-built drawings will be cause to delay progress payments. As-built drawings shall be available to the Engineer at all times during the life of the Contract. Upon request, the Owner will provide one set of reproducibles of the original Contract Drawings and a sample record drawing showing required style and quality, for this purpose.

General Contractor shall be responsible for coordinating, collecting and updating as-built drawings from subcontractors.

- 1) All drawings shall be made a part of the record drawings and shall include the following:

- a) Contract Drawings: Annotate or redraft, as required, to show all revisions, substitutions, variations, omissions and discrepancies made or discovered during construction concerning location and depth of utilities, piping, ductbanks, conduits, manholes, pumps, valves, vaults and other equipment. Revisions shall be made and shown on all drawing views with actual dimensions established to permanent points.

- b) Working Drawings: Same as a) above, when working drawings are required. Include, for example, actual layouts of conduit runs between various items or electrical equipment for power, control and instrumentation; wire sizes, numbers and functions; configuration of conduits; piping layouts; and duct layouts. Sections and details shall be added as required, for clarity. Drawings and switchgear, motors, control centers and other equipment shall be revised to show actual installations.

- 2) Prior to preliminary inspection, furnish a reproducible of the record drawings. At the completion of the Contract and before final payment is made, furnish the Engineer one set of reproducibles of the finally approved record drawings reflecting all revisions herein described. Contractor shall also provide an electronic copy on DVD that can be viewed through AutoCAD and Adobe PDF or other software used to produce the drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01346

SECTION 01370

SCHEDULE OF VALUES

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 includes the following:
 - 1. Provide schedule of values covering each lump sum 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 lump sum item equals the price bid for the respective lump sum item.
 - b. For "Mobilization and Demobilization", 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. Mobilization by activity
 - b. Delivered cost of product, including pipe, backfill materials, concrete and grout, adhesive anchor systems, bar racks and screens, pumps, conduits and wiring, fittings, and appurtenances.
 - c. Total installed cost with overhead and profit.
 - (1) Do not list overhead and profit as separate items.
 - d. For new pipes and manholes, include a breakdown for testing, and putting into service.
 - 4. An unbalanced schedule of values providing for overpayment on items of work performed first will not be accepted.

1.4 SEQUENCING AND SCHEDULING

- A. Prepare schedule of values covering each lump sum item after review of tentative schedule at preconstruction 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

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 Quality 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 6 - Contractor's Responsibilities, paragraphs 6.01 6.02, 6.03, 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 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 and masonry materials and mix designs, structural steel inspections, the design of asphalt mixtures, gradation and compaction 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, masonry, structural steel, 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, with minimum interference with

construction operations. The time and location of field sampling and testing shall be approved by the Engineer, 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 AND QUALITY CONTROL

- A. 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.
- B. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable 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.

- C. 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.

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.

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 days 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 manufacturer's 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 ASSURANCE AND QUALITY CONTROL

- A. Quality assurance and quality control is the responsibility of the Contractor, and the Contractor shall 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, 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 supercede or void that responsibility.

END OF SECTION 01400

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 PLANT AND HOURS OF CONSTRUCTION

- A. Furnish plant and 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 plant 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 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 obligations to secure the quality of the work and rate of progress required.
- B. Work in streets, roadways and areas adjacent to them shall cease at noon on days before legal holidays and at noon on Fridays prior to Monday holidays.
- C. Normal working hours shall be 7:00 A.M. to 4:00 P.M. Monday through Friday excluding legal holidays. Excessive noise and neighbor complaints could necessitate a reduction in work hours allowed at the water plant and reservoirs. The contractor shall work in consideration of their noise, their neighborhood impact, and be responsive to noise complaints. The contractor shall be permitted to work evening hours and/or weekends upon a written request to the Engineer & Owner a minimum of 48 hours in advance and written approval from the Owner is required.

1.3 OCCUPYING 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. A copy of the written consent shall be given to the Engineer, prior to entering or occupying private property.

1.4 PIPE LOCATIONS

- A. Exterior pipelines will be located substantially as indicated on the Drawings, but the right is reserved to the Owner, acting through the Engineer, to make such

modifications in location as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings, etc., are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.5 DIMENSION 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.

1.6 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, fencing, caution signs, lights, and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. 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. Costs incurred for public safety personnel to address unsafe conditions shall be the responsibility of the Contractor.

1.7 TEST PITS

- A. Exploratory Excavations or Test pits (for the purpose of determining subsurface conditions, for locating underground utilities or structures, or for determining the layout of proposed pipeline or structures) shall be excavated in advance of construction and backfilled by the Contractor at locations in areas where the Contractor deems it necessary to obtain subsurface information. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

1.8 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, notify the Police, Fire and School Departments in writing, with a copy to the Engineer, if the closure of a street or road is necessary. 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.

1.9 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.
- 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 workman like manner.

1.10 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. 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, 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. 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 existing water services, drain lines, and sewers). 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 Total Price Bid in the Bid Form.
- D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the City of Salem is required, he may direct the Contractor, in writing, to perform the work. Work so ordered will be paid 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 City of Salem will notify the Utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the City of Salem and 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 number 1-800-322-4844) at least 72 hours prior to start of work.
- E. 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.

1.11 INSPECTION OF WORK AWAY FROM THE SITE

- A. If work to be done away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, the Contractor shall give notice to the Engineer of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the inspection can be made.

1.12 COOPERATION WITHIN THIS CONTRACT

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and his 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.

1.13 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and as neat a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he 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 subcontractors shall comply with all applicable Federal, State, and local laws, and regulations 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 own expense and restore the area impacted.

1.14 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or 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. Should any of the floors or other parts of the structures become heaved, cracked, or otherwise damaged, 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.
- D. The Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

1.15 INSTALLATION OF EQUIPMENT

- A. Special care shall be taken to ensure proper alignment for all equipment. Equipment shall be carefully aligned by qualified installers. The anchor bolts shall be set in place and the nuts tightened against the shims. After the alignments have been approved by the Engineer, the equipment shall be secured in place. The alignment of equipment shall be further checked after securing, and after

confirmation of all alignments, the equipment shall be firmly grouted in place as applicable. 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.

1.16 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 Telephone: The Contractor shall at his own expense, provide his own temporary telephone as required for the prosecution and completion of work.
- C. Temporary Water: Water for drinking purposes and other usage will be provided by the Contractor at his own expense.
- D. Sanitary Provisions: The Contractor shall provide and maintain sanitary accommodations for the use of his employees and the Engineer, as may be necessary to comply with the requirements and regulations of the local and state departments of health.

1.17 WATER SUPPLY

- A. The Contractor shall make arrangements and pay for all water necessary for completion of construction operations under this contract.

1.18 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.

1.19 DUST CONTROL

- A. 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.
- B. Contractor shall not apply the material without approval of the Engineer.
- C. 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.

1.20 POLLUTION CONTROL

- A. The Contractor shall conduct clean-up and disposal operations, as necessary, to comply with state and local ordinances and anti-pollution laws.
- B. Outdoor burning of rubbish and waste material on the site will not be permitted.
- C. 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.

1.21 ENGINEER'S FIELD OFFICE

The Contractor is required to provide and maintain a construction trailer and construction toilet onsite through the duration of the contract with power, heat, light, permanent phone, and sufficient table space and chairs for meetings. Trailer to be made available for regular job meetings by the City of Salem and their designees and the Contractor shall contain a full and detailed project file including schedules, shop drawings, and samples.

1.22 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.

1.23 PROJECT SIGN

- A. A Project Sign is not required for this project.

1.24 TEMPORARY STOCKPILING/STAGING AREA

- A. A staging area within the work zone has been identified on the Project plans by the Owner. If additional construction staging area is needed, Contractor shall identify a location for a staging area and stockpile area, secure permission from the property owner in writing, and receive permission from the City before mobilizing to project area.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01500

SECTION 01505

MOBILIZATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes mobilization consisting of obtaining all permits; moving all plant and equipment onto the site required for the first month's operations; furnishing and erecting plants, temporary buildings, and project and other construction facilities; erecting project signs and traffic management signs; implementing security features and requirements; all as required for the proper performance and completion of the Work. Mobilization shall further include the following principal items:
1. Installing temporary construction power, wiring, and lighting facilities.
 2. Developing construction water supply.
 3. Providing a field office trailer for use by the CONTRACTOR and the ENGINEER as required, complete with all specified furnishings, office equipment, communications facilities, fax machines, computers, and utility services.
 4. Providing on-site sanitary facilities and utility series for the construction trailer.
 5. Arranging for and erection of Contractor's work and storage yard(s), including soil stock pile segregation and contamination of areas.
 6. Provide written permission from property owners for use of Contractor's proposed additional staging (stockpile area(s)).
 7. Having all OSHA required notices and establishment of safety programs.
 8. Having the Contractor's superintendent at the job site full time.
 9. Submitting initial submittals, including work plans and detailed project Schedule.
 10. Furnish and install project sign(s) if required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01505

SECTION 01551

PORTABLE CHANGEABLE MESSAGE SIGN

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work covered under this section shall consist of furnishing, maintaining, transporting and using a Trailer – Mounted Changeable Message Sign. Changeable Message Sign(s) shall be furnished as directed on Sheet TM-1 of Contract Drawings from two weeks prior to start of construction operations through completion of applicable work.
- B. All messages displayed shall be approved by the Engineer.

1.02 REFERENCES

- A. The following standard forms part of these specifications and indicates a minimum standards required:

Massachusetts Department of Transportation (MADOT)

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials required under this Section need not be new but must be in first class condition and acceptable to the Engineer. Any materials that in the judgement of the Engineer are unsatisfactory in appearance and/or performance shall be immediately replaced by acceptable units.

2.02 SPECIFIC REQUIREMENTS

Refer to Sections 0113-Submittals and Section 01440-Special Provisions for information regarding required certification that all materials, products, equipment and/or services.

- A. The Trailer-Mounted Changeable Message Sign shall meet the requirements of this specification and shall consist of the following major components;

- 1. Message Board
- 2. Operator Interface (CPU and Keyboard)
- 3. Power Supply
- 4. Towable Trailer

- B. Message Board

- 1. Type – they display can be Flip Disk, LED, or a combination of both Flip Disk and LED (Hybrid).

2. Size – The message board shall have a minimum height of 74-inches, maximum height 80-inches and a minimum width of 98-inches, maximum width of 115-inches.
3. Colors – The display shall be either fluorescent yellow or ITE amber.
4. Lines – The sign board shall have the capacity of displaying at least three lines of 18-inch characters with 1 to 9 characters per line.
5. Visibility and Viewing Angle – The sign shall be visible from a minimum distance of 900 feet with a viewing angle of no less than 30 degrees. The sign shall be either internally or externally illuminated for nighttime visibility.

2.03 OPERATOR INTERFACE

- A. A means of creating/controlling the onsite display message(s) shall be provided with each sign. The operator interface shall contain as a minimum the following:
 1. Operator's display terminal with keyboard will provide a full screen display to allow the operator to preview message content and format before it is sent to the sign panel. The keyboard shall be of standard design.
 2. Control (CPU)
 3. Lockable weatherproof enclosure for interface components.

2.04 CONTROLLER

- A. The controller shall possess, as a minimum, the following features:
 1. Full 32K user memory with the option for an additional 32k archive memory.
 2. Capacity to store a minimum of 199 pre-defined messages and a minimum of 50 user-created messages (not to exceed 32K).
 3. Changeable message flash rate capability.
 4. A minimum of 24 hour battery back-up.
 5. Password activation shall be software available.

2.05 POWER-SUPPLY

- A. The sign shall be capable of operation from the following sources:
 1. A diesel powered generator with a battery back-up.
 2. A battery with diesel generator with a battery back-up.
 3. The power supply shall have a cover for weather protection and shall be lockable for security.

2.06 TOWABLE TRAILER

- A. The trailer shall be of rugged construction suitable for towing at highway speeds and at low speed over rugged construction site terrain. The trailer shall have at least the following features:
1. Complete lighting to standard highway specifications.
 2. A single axle with two (2) – 15-inch wheels (3500 GVW rated).
 3. Two (2) inch ball coupler with heavy duty safety chains.
 4. Four (4) corner-located leveling swivel jacks capable of leveling the trailer on one (1) in six (6) grade and capable of stabilizing the trailer in high winds of up to 80 MPH. in addition, a tongue leveling swivel jack shall be provided.
 5. Surge breaks with lockable parking in conformance with Federal weight regulations.
 6. The sign shall be capable of being locked in a stowed position while being towed.
 7. A hydraulic lift mechanism shall be provided to elevate the sign to its operating position.
 8. It shall be possible to lock the sign panel in several off-angle positions with respect to the trailer axis for enhanced visibility.

2.07 ENVIRONMENTAL

- A. The Trailer-Mounted Changeable Message Sign shall be capable of performing all functions at ambient temperatures ranging from -30 degrees F to +165 degrees F. There shall be no degradation of operation due to fog, rain, or snow.

2.08 MAINTENANCE

- A. All components of the Trailer-Mounted Changeable Message Sign shall be readily accessible for ease of maintenance. Standard commercially available parts shall be used where possible.
- B. The sign shall require no special schedule maintenance. Maintenance shall include periodic cleaning. When not being used, at the discretion of the Engineer, the sign shall be stored in an approved secure area.

2.09 DOCUMENTATION

- A. As a minimum, the following documentation shall be supplied with each Trailer-Mounted Changeable Message Sign:
1. Operating Manual
 2. Parts Manual

3. Wiring Diagrams
4. Troubleshooting Guide

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All warning devices shall be subject to removal, replacement and/or repositioning as often as necessary. The changeable message unit shall be furnished and operational two weeks prior to start of construction operations and be positioned at the direction of the Engineer. The Contractor shall be responsible for the maintenance of such device and appurtenances, throughout its use on the project, with no additional compensation thereof, other than as provided under the contract unit price. Should the unit be found defective in any way it shall be replaced immediately at the Contractor's expense.
- B. For work under this contract, Contractor shall provide up to the bid quantity of unit days of message sign operations, with possibly up to two sign units operating simultaneously, as directed by the Engineer.

END OF SECTION

SECTION 01560

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes temporary environmental controls necessary for the project including dust abatement, rubbish control, sanitation, chemicals, and cultural resources.

1.2 EXPLOSIVES AND BLASTING

- A. The use of explosives on the Work will not be permitted.

1.3 DUST ABATEMENT AND CONTROL

- A. The Contractor shall prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from dust originating from its operations. The dust abatement measures shall be continued until the Contractor is relieved of further responsibility for the Work. Dust abatement measures shall include but not be limited to spraying water, applying calcium chloride, or placing temporary pavement on and around trenches and at work sites.
- B. During excavation of soil/fill material dust shall be controlled to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.
- C. Ambient dust levels at the site shall be monitored by the Contractor prior to construction. During construction, real-time dust monitoring shall be conducted during any soil/fill handling activities. The monitoring shall consist of total dust testing using MIE, Inc. Miniram PDM-3 Dust Monitors, or like instruments. The total dust criteria at the site shall conform to the requirements of the HASP. Should fugitive dust quantities exceed 20 percent of the ambient level, the Contractor shall perform additional measures to reduce the total dust concentrations.
- D. Nuisance dust levels may be encountered during regrading activities and excavation. Dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor, and Odor Control Plan shall describe the procedures and materials to minimize dust.

- E. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.
- F. Areas of exposed earth to be excavated shall be lightly sprayed with water before excavation. Additional water spray may be utilized only when any indication of excessive dust is observed. The Contractor shall minimize the use of water within the limits of excavation.
- G. Access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

1.4 RUBBISH CONTROL

- A. During the progress of the Work, the Contractor shall keep the Site and other areas used by it in a neat and clean condition and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Site and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the Site in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.
- B. In the event that the Contractor's work zone restricts municipal trash or recycling collection or makes it difficult for residents to bring trash or recycling to the street, the Contractor shall collect all trash and recycling within the work zone and transport it outside the work zone for municipal collection. Return trash and recycling receptacles back to respective properties.

1.5 SANITATION

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the Site in a manner satisfactory to the Work and in accordance with all laws and regulations pertaining thereto.

1.6 CHEMICALS

- A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

1.7 CULTURAL RESOURCES

- A. The Contractor's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").
- B. The Contractor shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.
- C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:
 - 1. The Engineer will issue a Field Order directing the Contractor to cease all construction operations at the location of such potential cultural resources find.
 - 2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the State Historic Preservation Office.
- D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the State Historic Preservation Office, the Contractor shall suspend work at the location of the find under the provisions for changes contained in Articles 10, 11, and 12 of the General Conditions.

1.8 NOISE CONTROL

- A. The Contractor shall comply with the City of Salem Noise Ordinance.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 01560

SECTION 01568

EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS

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. Provide all work and take all measures to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected working area as to prevent damage to any stream or wetlands.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Two weeks prior to the start of the work, submit to Engineer, for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction which include use of a sedimentation tank, silt sacks, and erosion and sedimentation barrier.
 - 2. Submit to the Engineer manufacturer's data sheets for filter fabric, silt socks, silt sacks, mulch, salt hay, and sedimentation tank.

1.4 QUALITY ASSURANCE

- A. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.
- B. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.
- C. If construction materials are washed away during construction, remove materials from fouled areas.
- D. Stabilize diversion outlets by means acceptable to Engineer.

- E. Engineer has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct immediate permanent or temporary pollution control measures to prevent contamination of any stream or wetlands, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

PART 2 – PRODUCTS

2.1 BALES

- A. Hay or straw or other suitable material acceptable to Engineer.
 - 1. Twine for bale bales shall be biodegradable.
 - 2. Hay bales shall be salt marsh hay as approved by the City of Salem Conservation Commission.

2.2 WOOD STAKES

- A. 2 in. by 2 in. by 3 ft.

2.3 FILTER FABRIC

- A. Provide silt fence conforming to the requirements specified in Section 02273.

2.4 SILT SOCK

- A. Silt sock or mulch sock shall be 12”-18” and manufactured by Silt Soxx or equal.

2.5 MULCH

- A. Mulch and/or compost materials used to fill silt sock shall be approved by the City of Salem Conservation Agent.

2.6 SILT SACKS

- A. Provide woven poly propylene fabric bags to prevent sedimentation from entering existing catch basins. Bags shall be manufactured by ACF Environmental or equal.

2.7 STRAW WATTLES

- A. Straw wattles shall consist of certified seed free agricultural straw inside and flexible and durable tubular netting with knotted ends. Wattles shall be 12-inches in diameter and staked to the ground every 3-4 feet.
- B. Straw wattles shall overlap horizontally at least one-foot every prevent bypass. Tubular black polypropylene shall be photodegradable.

PART 3 – EXECUTION

3.1 GENERAL

- A. Do not discharge chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste into or alongside any body of water or into natural or man-made channels.
- B. Contractor shall be responsible for all the requirements of the City of Salem Conservation Commission Letter Permit or Order of Conditions.

3.2 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 sedimentation barriers immediately after site is cleared and before trench excavation. Locate sedimentation barriers, surrounding stored material, approximately 6 ft. from material.
- C. Hold bales in place with two 2 in. by 2 in. by 3 ft. stakes so that each bale is butted tightly against ad-joining bale thereby precluding short-circuiting of erosion check.
- D. Construct mulch sock berms or diversions to intercept and divert runoff water from critical areas.
- E. Protect catch basins from sedimentation by installing silt sacs, hay bales around the basin or siltation fabric under grating casting.
- F. Discharge silt-laden water from excavations into sedimentation tank and then onto filter fabric mat, sedimentation basin, and/or baled hay or straw sediment traps to ensure that only sediment-free water is returned to watercourses.
- G. Do not place excavated soil material adjacent to water-course in manner that will cause it to wash away by high water or runoff.
- H. Prevent damage to vegetation by excessive watering or silt accumulation in the discharge area. Prevent damage to vegetation adjacent to or outside of construction area limits.
- I. Prevent indiscriminate, arbitrary, or capricious operation of equipment in streams, wetlands or surface waters. Do not dump spoiled material into any streams, wetlands, surface waters or unspecified locations.

- 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. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, wash water 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.
- L. Do not alter flow line of any stream unless indicated or specified.
- M. Clean and dispose of debris from sedimentation tanks, basins, and barriers on a weekly basis.
- N. Upon completion of work and upon approval of Conservation Commission and Engineer, remove and dispose of sedimentation barriers.

3.3 SEDIMENTATION AND EROSION CONTROL:

- A. The Contractor shall plan and execute all operations, particularly those associated with excavation and backfilling, in such a manner as to prohibit excavated and exposed fill or other foreign material to be washed or otherwise carried into streets, drains or waterways. The water quality of waterways, or storm drains shall not be degraded due to construction operations.
- B. It is the intent of these Specifications to prevent the unnecessary occurrence of sedimentation or siltation of storm drains and watercourses. In the event that sedimentation or siltation prevention measures used by the Contractor prove to be inadequate the Contractor shall be required to adjust his/her operations to the extent necessary to prevent any such sedimentation or siltation from occurring. Any damage or degradation caused by inadequate controls must be restored by the Contractor at no additional cost to the Owner.
- C. Provide positive means of erosion control such as mulch sock barrier around construction to carry off surface water. Erosion control measures such as sedimentation basins, hay bale or mulch sock check dams, and other equivalent techniques shall be used as appropriate. Offsite surface water shall be diverted around the site to a downstream channel ahead of siltation barriers. Flow of surface water into excavated areas shall be prevented.
- D. The Contractor shall keep drains, streams and other water crossings clear of mud, silt, debris, or other objectionable materials resulting from construction operations.
- E. The Contractor shall use temporary pavement geotextile and mulching to protect areas exposed during construction. He/she shall minimize the amount of bare earth exposed at any one time during construction, and he/she shall also minimize the length of time bare earth is exposed.

- F. Baled hay and filter materials shall be placed to form temporary water stops, dams, diversions, dikes, berms, and for other uses connected with water pollution control. As directed by the Owner and/or their representative, bales may be disposed by the Contractor as best suits field conditions and requirements.
- G. On sloping terrain, hay bales may be used to trap sediment until vegetation has become established. The details of their placement shall be incorporated into the Erosion and Sedimentation Control Plan, as approved by the Owner or Engineer.
- H. Sediment-laden water that is being pumped from the trenches or excavations shall not be pumped directly into storm drains or water courses. Sedimentation tanks used in conjunction with hay bale or mulch sock sedimentation basins or other means acceptable to the Owner or Engineer shall be used for this purpose.
- I. All excavated waste materials and collected solid waste, shall be handled in accordance with the Contractor-prepared, Owner or Engineer -accepted, Waste Management Plan.
- J. The Contractor shall include the cost of sedimentation and erosion control work in his total bid price.

3.4 PROTECTION OF STREAMS WETLANDS, AND SURFACE WATER:

- A. Care shall be taken to prevent or reduce to a minimum any damage to any stream, drainage ditch, 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 stream, shall not be directly returned to the stream. Such water will be diverted through a sedimentation tank and sedimentation 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 within express written authority or permit from the governing agency. Water from dewatering operations shall be treated by filtration, sedimentation tanks and 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 the Massachusetts Department of Environmental Protection regulations. The Contractor shall be responsible for returning the site to pre-existing conditions at no additional cost to the Owner.

END OF SECTION 01568

SECTION 01600

CONTROL OF MATERIALS

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 APPROVAL OF MATERIALS

- A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.
- B. As specified in Section 01300, the Contractor shall submit to the Engineer, data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.
- C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.
- D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.
- E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, the Contractor shall provide such samples of workmanship or finish as may be required.
- F. The materials and equipment used on the work shall correspond to the approved samples or other data.

PART 2 - PRODUCTS (NOT USED)

PAGE 3 - EXECUTION (NOT USED)

END OF SECTION 01600

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.

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 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, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

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.
 - 1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.
 - 2. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
 - 3. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.
 - 4. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01610

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.

1.3 RELATED WORK

- A. Warranties and Bonds are included in Section 01740.

1.4 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.

1.5 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean.
 - 3. Contractor shall have the installing Subcontractor shall wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - 4. 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

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 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 01710

SECTION 01740

WARRANTIES AND BONDS

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 general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's 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 Project Closeout.
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.
- 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 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 through 16 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 Project Manual.
- 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 Project Manual, 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 warranted Work 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 warranted Work.
- 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 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

SECTION 01850

TRAFFIC MANAGEMENT

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 includes the following:
 - 1. Pedestrian and vehicular traffic and other safety control devices, requirements and management for the protection of the traveling public and working personnel during construction and related operations, as approved by the Owner.
 - 2. The design, application, and installation of all devices required by this section shall conform to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and Part VI Latest Edition, published by the U. S. DOT, latest edition, American Disabilities Act (ADA), and the Commonwealth of Massachusetts, Highway Department (MHD), Standard Specifications for Highways and Bridges, Section 850, except as modified herein.
 - 3. Traffic control during construction and maintenance operations includes installing and maintaining temporary pedestrian and construction facilities, furnishing, installing, inspecting, resetting, and removing channelization devices necessary to maintain pedestrian and vehicular traffic during construction and fencing of excavations as required.
 - 4. "Approved by the Owner" throughout this Section shall mean the approval of the City of Salem.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTAL PROCEDURES:
 - 1. Traffic Management Plan: Where designs for pedestrian and traffic control devices are not indicated on the Contract Drawings, the Contractor shall submit to the Owner for approval, a traffic management plan, complete with details of the proposed methods, including materials.

2. Shop Drawings

- a. Submit complete shop drawings for staged construction, and temporary pedestrian and construction facilities and sidewalks, as needed, certified by a Professional Engineer registered in the Commonwealth of Massachusetts.
- b. Show on the shop drawings all materials, including traffic control devices, signs and methods of installation.
- c. Include with the shop drawings alignment tapers, lane widths, police detail locations, temporary pavement markings, barriers and traffic control device spacing.

3. Safety Signing for Construction Operations. Where not indicated on the Contract Drawings, the Contractor shall submit temporary pedestrian and construction facilities plan and sign placement and sign size sketches showing the proposed sign setups he intends to use to provide the necessary traffic control and protection during the progress of the work, plus the sign and legend size and layout. These sketches shall be submitted to the Owner for review and approval before work begins.

4. The Contractor shall submit to the Owner the information required by this section a minimum of 14 working days prior to the start of construction and prior to the start of construction at any new location throughout the duration of work under this contract.

5. Before starting any work under this Contract, the Contractor shall prepare, and submit to the Engineer for approval, a plan that indicates the traffic routing proposed by the Contractor during the various stages and time periods of the work, and the temporary pedestrian and construction facilities, temporary barricades, signs, drums, and other traffic control devices to be employed during each stage and time period of the work, to maintain traffic and access to abutting properties. Particular care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. Traffic control devices required only during working hour operations shall be removed at the end of each working day.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 and 01610 and as specified.
- B. No material shall be stored within the work area or on adjacent roadways or residential streets except which is needed to complete the work for that day.

1.6 SYSTEM DESCRIPTION

- A. Materials required for the work of this Section need not be new, but must be in first-class condition and acceptable to the Owner. Any materials that in the judgment of the Owner are unsatisfactory in appearance or performance shall be removed and immediately replaced by acceptable units.
- B. Signs, portable barricades, and drums shall have "Type III High Intensity Encapsulated Lens Reflective Sheeting" in accordance with Section M9.30.0 of the 1995 MHD Standard Specifications for Highways and Bridges and MUTCD requirements.
- C. Safety Signing for Construction Operations shall be fabricated in accordance with the provisions of subsection M9.30.0, Type III or IV High Intensity, of the MHD Standard Specifications for Highways and Bridges, where these colors are specified.
- D. Portable Type III Barricades shall conform with Standard Plate No. 406.2.0 of the MHD Construction and Traffic Standard Details (Metric Edition). Reflectorized sheeting to conform to Section M9.30.0 Type III or IV, of the MHD Standard Specifications for Highways and Bridges.
- E. Pre-cast concrete median barrier shall conform with Standard Plate No. 401.15.0 of the MHD Construction and Traffic Standard Details.
- F. Traffic Drums shall conform to Standard Plate No. TR.7.1 of the MHD Construction and Traffic Standard Detail and provided in the type and quantity required by the standards specified herein.
- G. Temporary pavement markings and devices shall be used as required by MUTCD and ADA standards for traffic control and pedestrian safety.
- H. The Contractor shall provide necessary access for fire apparatus and other emergency vehicles through the work zones to abutting properties at all times.
- I. At the end of each working period, trenches in areas of public travel shall be covered with steel plates; each edge of the plates shall be either beveled or protected by a bituminous concrete ramp at a slope of two feet horizontally to 1-inch vertically. Any temporary patching material may be used to construct the ramps. The cost of necessary patching materials, and their maintenance and removal, will be considered incidental to the work being performed with no separate payment.
- J. Sweeping and cleaning of surfaces beyond the limits of the project required to clean up material caused by spillage or vehicular tracking during the various phases of the work shall be considered as incidental to the work being performed under the Contract and there will be no additional compensation. Sweeping and cleaning shall be done daily.

1.7 UTILITIES

- A. The Contractor shall be responsible for the coordination of his/her work with all utility work being performed by utility owners in relation to this project or projects adjacent to this project. The Contractor shall phase all work in a manner that will provide positive and safe through movement of traffic passing the construction site.

1.8 TEMPORARY LIGHTING

- A. The Contractor shall provide all the temporary lighting to properly illuminate the work area and approaches in the event of nighttime work.

1.9 EXCAVATIONS

- A. Open excavations adjacent to the traveled way or shoulders shall not remain open through non-work hours unless adequately steel plated for the passage of heavy vehicles and specifically authorized by the Engineer.

1.10 PERMITS

- A. The Contractor shall be responsible for obtaining all permits to perform the work.

1.11 ACCESS TO PROPERTIES

- A. At least one serviceable driveway access to all residences and businesses within the project shall be maintained at all times.

1.12 HAULING

- A. The Contractor is advised that all roads and bridges within or adjacent to the project shall be subject to legal loads and vehicles.
- B. The Contractor is advised that no agreements have been made by the City of Salem or the MHD with surrounding cities or towns to relieve the Contractor of liability for damage to local roads and bridges caused by the Contractor's operation. The Contractor shall contact appropriate officials of the surrounding cities or towns concerning hauling over Salem roads and bridges.

1.13 TRAFFIC CONTROL STANDARDS AND SPECIFICATIONS

- A. The following standards and specifications are to be considered to be part of the Traffic Control Plan:
 - 1. Section 850 of the MADOT Standard Specifications.
 - 2. Manual on Uniform Traffic Control Devices, current edition including all revisions, amendments and addenda.

1.14 BARRICADES, WARNING SIGNS AND OTHER PROTECTIVE DEVICES

- A. Install, inspect, remove and rest all temporary construction elements in accordance with an approved construction staging sequence and traffic management plan.
- B. Regulatory and warning devices shall be subject to removal, replacement, and repositioning as often as necessary, and as directed by the Owner.
- C. Maintenance of Construction and Regulatory Signing
 - 1. Safety signing for construction operations shall consist of furnishing, positioning, repositioning, inspecting, maintaining, and removing regulatory, warning, and guide signs and temporary bus stop signs and taxi stop signs and their supports as approved by the City of Salem.
 - 2. Replace all signs which are damaged or are missing from their location without additional compensation.
 - 3. Maintain all signs in a satisfactory manner including the removal of dirt or road film that cause a reduction in sign reflective efficiency.
- D. Portable Barricades
 - 1. Furnish, install, relocate, remove, re-install, and maintain portable barricades in accordance with MHD and MUTCD requirements or as directed by the Owner.
 - 2. Barricades shall be maintained in good and serviceable condition throughout the duration of the Contract.
 - 3. Temporary pedestrian and construction facilities shall be kept clean and freshly painted as required.
- E. Signs, Covered
 - 1. Cover any existing regulatory and warning signs as necessary and as directed by the Owner.
 - 2. Use a cover approved by the Owner, which shall be securely fastened to the existing sign and shall completely cover the legend of the existing sign. The cover shall remain in place as long as necessary at which time it shall be promptly removed.
 - 3. Signs shall be covered without causing any damage to the existing sign.
- F. Traffic Signals
 - 1. Traffic signals shall remain operable at all times throughout the duration of the contract unless approved otherwise by the Owner.

2. It shall be the Contractor's responsibility to maintain the traffic signal system in good working order. The Contractor, at his expense, shall repair any damage to the traffic signal system resulting from the Contractor's work. Any alterations made to traffic signals needed to perform the work in this Contract shall be done by a Contractor certified to work on traffic signal installations and will be subject to the approval of the signal owner.

G. Temporary Pre-cast Concrete Median Barrier

1. Temporary pre-cast concrete median barrier shall be furnished and installed, once relocated, as shown on the traffic management plans and where required by the Engineer to protect work zones and excavations, which cannot be completed and backfilled within a daily work period. Barriers shall be removed when no longer required.
2. Temporary pre-cast barrier for use for temporary pedestrian and construction facilities shall have three (3) shelves cast in the barrier to receive a post for panel and fence installations.

I. Temporary Safety Fencing

1. Temporary orange plastic safety fencing, 4 feet high, shall be erected at work zones abutting pedestrian travel paths and at work zones hazardous to pedestrians, as determined and required by the Engineer.

1.15 TRAFFIC OFFICERS SERVICE

- A. Uniformed officers shall be utilized to maintain safe traffic flow throughout the construction period.
- B. Forty-eight hours of advance notice of starting work shall be given to the City of Salem Police Department. Contractor is required to use as many police details as needed to ensure the safety of pedestrians and traffic at all times. Additional police details shall be provided at the Owner's request.

1.16 PEDESTRIAN TRAFFIC

- A. Sidewalks shall be maintained at all times through the construction period. Temporary sidewalks, pedestrian detours and pedestrian and construction facilities shall be constructed as needed to maintain pedestrian traffic and business access, as shown on the plans or as ordered.
- B. Pedestrian access will be provided to abutting land uses such as residences and businesses at all times, as approved by the Owner and in accordance with MUTCD and ADA requirements.
- C. Unobstructed walkways of 6 feet minimum width, unless otherwise approved by the Owner, will be provided at all times.

- D. Temporary pedestrian walkways shall be separated from roadway and constructed areas by barricades as approved by the Owner.

1.17 TRAFFIC CONTROL REQUIREMENTS

- A. The Contractor shall meet the following conditions, unless otherwise specifically approved by the Engineer:
 - 1. All work shall be prosecuted with proper regard for the convenience of the public and in a manner to permit unimpeded traffic flow whenever possible. The interruption of traffic will not be permitted unless specifically allowed by the Engineer and in accordance with the requirements of the Owner and in conformance with MUTCD requirements.
 - 2. The Contractor shall be responsible for coordination with the Owner's departments affected by the project.
 - 3. Traffic control devices and signs shall be removed, demounted or properly covered for those periods of the day not in use.
 - 4. The City of Salem DPW shall be notified of any re-routing of traffic 72 hours in advance. Approval must be obtained from the Owner prior to any rerouting of traffic (except emergencies). Coordination with other Salem agencies or departments will be by the DPW.
 - 5. The Contractor shall coordinate the work with the schedules of delivery trucks to the adjacent stores and property owners so as not to impede their access.
 - 6. No operations shall be conducted, including the loading or unloading of vehicles, on or near the traveled lanes or road shoulders without first erecting warning signs and channelizing devices as directed. These precautions shall be maintained at all times while work is in progress.
 - 7. Construction signs and channelizing devices shall be used to separate traffic from the work areas and for traffic control. Placement, other than as shown in the plans or the MUTCD, will require prior approval.
 - 8. Temporary signs and channelizing devices shall not be set up until there is adequate visibility or appropriate construction lighting. The Contractor shall schedule his work so that temporary signs and channelizing devices are removed and traffic is returned to its normal pattern before the end of the work period.
 - 9. Work requiring overnight lane closures shall not begin until all materials required for the completion of each nights work are delivered or available to the project site, unless otherwise approved by the Engineer.

10. Accesses to residences and businesses shall be maintained at all times.
11. Work operations shall not be performed on the roadway in such a manner that traffic is obstructed or endangered simultaneously from both sides of the roadway.
12. The Contractor shall keep all roadway areas open to traffic as clear as possible at all times. Materials shall not be stored on any roadway area or within 10 ft. of the traveled way. Material shall be delivered to the installation areas as they are needed to provide a continuous installation. Location of storage areas shall be subject to approval.
13. The Contractor shall remove all equipment and construction vehicles from the traveled way and shoulders open to traffic during non-work hours. Vehicles shall be parked no closer than 10 feet from the traveled way in pre-approved areas unless specifically permitted.
14. The Contractor shall furnish 60" x 30" approved signs reading "CONSTRUCTION VEHICLE - DO NOT FOLLOW" to be used on trucks hauling to the project, when such signs are deemed necessary by the Engineer. The color, type of sheeting and size of lettering shall conform to that of the permanent construction signs.
15. Each driver of any vehicle used on this contract shall be furnished written instructions concerning the manner of operation for that vehicle. Specifically, these instructions shall warn against stopping on the traveled portions of the roadway, against passing other vehicles, and against traveling in close proximity to other vehicles. A copy of these instructions shall be given to the Engineer.
16. Temporary signs and channelizing devices shall not be set up in inclement weather.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not used)

END OF SECTION 01850

SECTION 02010

SUBSURFACE INVESTIGATION

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. The Contractor acknowledges that he/she has satisfied himself 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, and roads; uncertainties of weather; groundwater table or similar physical conditions at the site; the characterization and 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 that can in any way affect the work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself 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.
- B. The Contractor's attention is directed to Article 4 of Section 00700 - GENERAL CONDITIONS pertaining to Subsurface and Physical Condition.

1.3 SUBSURFACE DATA

- A. Limited Subsurface Investigations have been completed by the Engineer or Owner in some locations within the project area and adjacent areas as part of the design of this project. Additional Subsurface Investigations completed by others in adjacent areas as part of other projects in the area and are attached to these Contract Documents for reference.
- B. The Contractor acknowledges that he/she assumes all risk contingent upon the nature of the subsurface conditions to be actually encountered by him/her in performing the work covered by the Contract, even though such actual conditions may result in the Contractor performing more or less work than he/she originally anticipated.
- C. The Contractor shall be aware that borings have been provided in some locations, but the existing soil conditions and groundwater level are not known in all areas. Contractor shall assume that construction dewatering due to

groundwater, rock and ledge removal, and removal and disposal of unsuitable soils will be required during construction.

- D. The Contractor shall be aware that this project is in close proximity to the ocean and filled areas, and unsuitable soils area assumed to exist, and groundwater levels are assumed to be high and highly variable.
- E. Re-use of excavated soils on- or off-site is subject to local, state and federal regulations. Excess, displaced soil shall be re-used or disposed off site at no additional cost to the Owner.
- F. The Contractor shall be responsible for soil and fill transport and disposal.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 02010

SECTION 02050

DEMOLITION, ALTERATION, ABANDONMENT

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Demolish and alter existing pipe and structures as indicated on drawings, as specified, and as directed by Engineer.
 - 2. Remove designated pipes, structures, valves, fittings, and appurtenances.
 - 3. Remove, salvage, or otherwise dispose of minor site improvements as specified in Section 02100 – SITE PREPARATION.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02100 – SITE PREPARATION
- C. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- D. Section 03315 – GROUT

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Submit to Engineer for review, a demolition plan describing proposed sequence, methods, and equipment for demolition and disposal as required.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. Demolish and remove existing construction, utilities, equipment, and appurtenances without damaging integrity of existing structures, equipment, and appurtenances that are to remain.
- C. Store equipment to be salvaged for relocation where directed by Engineer, and if necessary, protect from damage during work.

- D. Repair or remove items that are damaged. Repair and install damaged items at no additional compensation and to condition at least equal to that which existed prior to start of work.
- E. Exercise all precautions for fire prevention. Make acceptable fire extinguishers available at all times in areas where demolition work by burning torches is being done. Do not burn demolition debris on or near site.
- F. Protect persons and property throughout progress of work. Proceed in such manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel.
- G. Obtain permission from Engineer before abandoning or removing any existing pipes, structures, materials, equipment and appurtenances. Provide Engineer with 5 working day notification prior to abandoning/removing.
- H. Make arrangements with and perform work required by utility companies and municipal departments for discontinuance or interruption of utility services due to demolition work.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable codes and requirements for demolition of structure, safety of adjacent structure, dust control, service utilities, and discovered hazards.
- B. Dispose or recycle all demolition debris in accordance with all applicable regulations.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

- A. Provide, erect, and maintain temporary barriers and security devices.
- B. Notify Engineer of procedures which may affect property, or potential noise, utility outage, or disruption. Coordinate with Engineer as needed.
- C. Erect and maintain weatherproof airtight closures for exterior openings.
- D. Erect and maintain temporary partitions to prevent spread of dust, odors and noise to permit continued Engineer occupancy.
- E. Protect existing items, which are not indicated to be removed.
- F. Arrange with, pay for all required fees, and perform work required by utility

companies and municipal departments for discontinuance or interruptions of utility services due to demolition work.

3.2 DEMOLITION REQUIREMENTS

- A. Conduct demolition in accordance with approved plan, so as to minimize interference with adjacent building areas.
- B. Under no circumstances shall explosives be used.
- C. Conduct operations with minimum interference to public or private accesses.
- D. Maintain protected access and egress at all times. Do not close or obstruct roadways without permits.
- E. Cease operations immediately if adjacent structure appears to be in danger. Notify Engineer.

3.3 SELECTIVE DEMOLITION

- A. Demolish and remove components in an orderly and careful manner.
- B. Protect existing supporting structural members and equipment.
- C. Confine apparatus, storage of materials, demolition work, new construction, and operations of workmen to areas that will not interfere with continued use and operation of entire facility. Provide and maintain lights, barriers, and temporary passageways for free and safe access.
- D. Wet down work during demolition operations to prevent dust from arising. Provide maximum practicable protection from inclement weather for materials, equipment, and personnel located in partially dismantled structures. Provide shoring or bracing where necessary to prevent settlement or displacement of existing or new structures. Do not overload floors. Complete demolition work on upper levels before disturbing supporting members on lower levels.
- E. Cap or plug with brick and mortar, as indicated, pipes and other conduits abandoned due to demolition.
- F. Upon removal of equipment, cut anchor bolts flush with concrete pads, manhole structure walls or floor.

3.4 ABANDONMENT

- A. Disposal of all materials shall be performed in compliance with applicable local, state, and federal codes and requirements. Provide labor, equipment, and materials to perform work as specified and indicated.
- B. The Contractor shall flush all pipe and structures to be removed or abandoned to

remove solids and objectionable material prior to commencing demolition, modification, or abandonment.

- C. When existing pipe is removed, the Contractor shall plug all resulting abandoned connections whether or not shown. Where removed piping is exposed, the remaining piping shall be blind-flanged, fitted with a removable cap or plug, or bulk headed. Where existing piping, to include catch basin laterals, is to be abandoned, the Contractor shall cut back the abandoned pipe for a distance of 5 feet (1.524 meters) from any connecting structures to remain. Pipes to be abandoned in structures to be abandoned may be capped, plugged or bulk headed from inside the structure. All holes at the existing structures shall be repaired. Abandoned pipe smaller than 10 in. diameter shall be capped or plugged at both ends prior to backfill. Abandoned pipe 10 in. diameter and larger shall be filled with Controlled Density Fill (CDF) prior to being capped, plugged, or bulkheaded and backfilling unless otherwise directed. Each pipe reach to be abandoned with CDF shall be filled with CDF from the up-gradient end of the pipe reach wherever possible. The CDF shall completely fill each pipe reach and flow out the other end. The Contractor can aid the flow of the CDF in the pipe by providing a temporary structure at the access point to build up head or by pumping the CDF or by providing vibration in the pipe reach or access point. Requirements for Controlled Density Fill are described in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- D. Where existing drainage structures such as catch basins, drain manholes, sewer manholes, and combined sewer manholes are to be abandoned in place, the Contractor shall remove the frames, grates, and covers and cut the structures down a minimum of 2 feet below final grade or remove the entire structure including based as directed. The Contractor shall put a minimum of four (4), 2-inch diameter drainage holes in the invert of each structure and then backfill the structure with flowable fill, sand, or gravel as specified and as directed by the Engineer. Backfill around the structure shall be in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- E. Permanent plugs shall be constructed of Class B concrete, brick or other material approved by the engineer.
- F. Fill excavations with solid fill resulting from earth removal operations and/or with select borrow material in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING and the Contract Drawings. Final grade to be restored in kind unless otherwise noted.
- G. Exercise precautions for fire prevention. Make fire extinguishers approved for Class A, B and C fires available at all times in areas where performing demolition or abandonment work with burning torches. Do not burn demolition debris on site.

3.5 SALVAGE

- A. Materials, equipment, and appurtenances removed, that are not designated for relocation, or future use by Engineer shall become property of Contractor. Haul from site and dispose of at no additional compensation.
- B. Remove, store and protect the following materials and equipment until such time as the Engineer reviews them and requests relocation for future use. If upon review the Engineer declines to salvage the following material, the Contractor shall dispose of the items legally and at no additional cost to the Owner.
 - 1. Existing gates, frames, covers, valves, piping, and appurtenances in existing manholes, catch basins and tide gate structures.
- C. All salvaged items shall be relocated to a location identified by the Engineer.

3.6 CLEAN UP

- A. Remove demolished materials from site as work progresses.
- B. Leave areas of work in clean condition.
- C. Upon completion of demolition, the contractor is required to implement his approved sampling plan, outlined in the paint debris collection plan, on all collected paint debris.
- D. All cobbles to be kept, as practical, and delivered to OWNER.

3.7 REPAIR OF DAMAGE

- A. Any damage to existing facilities to remain, as caused by the Contractor's operations shall be repaired at no additional cost to the Engineer. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this Contract.
- B. Promptly repair damage to adjacent construction caused by selective demolition operations.
- C. Patching: Comply with Section 01045 – CUTTING, CORING, AND PATCHING.
- D. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- E. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

3.8 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT

END OF SECTION 02050

SECTION 02080

SOIL AND WASTE MANAGEMENT

PART 1 – GENERAL

1.1 OBJECTIVE AND OVERVIEW

- A. It is the objective of soil/fill management practices specified here to handle all soil/fill excavated from the site during the course of this contract in a cost-effective manner and in accordance with applicable state and federal regulations. The Contractor shall reuse geotechnically suitable excavated materials prior to using imported fill in order to reduce the volume of material to be disposed off-site. Imported backfill shall be used only as accepted by the Engineer.
- B. The specifications detailed herein require the Contractor to segregate soil/fill strata of varying geotechnical and contaminant levels during excavation. The excavated soil/fill material shall then be reused within the *area of excavation* to the maximum extent possible provided the material is geotechnically suitable as backfill and does not result in spreading contamination to other areas or other soil/fill strata. Excavated soil/fill, which is displaced by design features, (e.g. pipe and manholes), may be used as backfill elsewhere on the project provided the soil/fill is geotechnically suitable and does not result in spreading contamination or degrading the environmental quality at the location of reuse. Excavated soil/fill, which cannot be reused on site, shall be subject to reuse or disposal off-site.
- C. The Contractor shall be responsible for coordinating waste disposal, and as such, shall be responsible for identifying an appropriate facility which can receive the material and, if necessary, collect additional characterization samples to satisfy local, state, and federal regulations as well as the Contractor selected disposal facility's acceptance criteria.
- D. In general, excavation and soil/fill management is expected to substantially occur as follows:
 - 1. Excavate and remove road surfacing material and road sub-base material (asphalt, railroad ties, brick and cobbles, rails, concrete road base, etc.) and recycle/dispose as appropriate. These materials are to be kept separate from the soil/fill and disposed or reused accordingly. Removal of road surfacing and road sub-base materials are separate from soil/fill management.
 - 2. Generally, three (3) soil/fill strata are anticipated to be encountered though, the Contractor shall be prepared to handle as many strata as are encountered. The soil/fill strata anticipated includes: fill, silt/clay, and sand. Each strata shall be segregated as it is encountered, field screened and stockpiled separately.

1.2 DESCRIPTION

- A. This Section describes the general parameters and requirements for testing, excavation, handling, storage, tracking, removal, transport, reuse and disposal of contaminated urban fill and natural soils.
- B. The Contractor shall handle excavated soil/fill in accordance with all applicable federal, state, and local laws and regulations.
- C. The Contractor shall examine all other sections of the specifications for additional work requirements which affect this Section whether or not specifically mentioned in this section.
- D. In the course of the Work, it may be necessary to excavate and handle potentially contaminated soil/fill. The soil/fill management practices specified herein apply to all soil/fill excavated during the course of this contract whether contaminated or not.
- E. The Contractor shall hire an Environmental Professional qualified to prepare and implement all required plans detailed in the specification section including but not limited to the: Health and Safety Plan (HASP); Soil and Fill Management Plan; Dust, Vapor and Odor Control Plan; Personnel and Equipment Decontamination Plan; Contingency Materials Plan; and Spill and Discharge Control Plan.
- F. The Contractor is solely responsible for developing a HASP suitable for workers on site and the Contractor's use. The Owner and/or their representative are not responsible for establishing or enforcing the health and safety requirements of the Contractor, and nothing herein shall relieve the Contractor from its exclusive responsibility for the health and safety of its employees and/or its representatives and/or subcontractors. The Contractor shall be required to defend, indemnify, and hold the City of Salem and the Engineer harmless against any and all claims, liabilities, fines, or penalties arising out of actual or alleged failure of the Contractor and/or its agents, employees, or subcontractors to comply with any health or safety regulation, rule, ordinance, legislation, and/or health and safety plan.
- G. The Contractor shall hire an Environmental Professional qualified to coordinate all soil/fill-handling activities with the Owner or Engineer and/or their representative. The Contractor shall properly handle waste materials, including, but not limited to, construction debris, municipal waste, boulders, soil, fill, ash, rubble, and empty or crushed drums and/or drum parts. The Contractor shall institute procedures to protect site workers and the public from these materials.
- H. Any material which is an unknown, material (as defined in this specification section), requiring special handling and which can not be readily identified as a non-hazardous waste material shall be handled separately in order to characterize its nature as specified herein.
- I. All incidentals, Contractor-generated waste (such as Personal Protective Equipment, decon wash, etc.,) resulting from the services hereunder shall be the

property and responsibility of the Contractor and shall be disposed of by manifest and/or by a Massachusetts Bureau of Waste Site Cleanup Bill of Lading (BWSC Form 012) by the Contractor. All waste removal and transportation from the project site shall remain the obligation of the Contractor. All samples and laboratory by-products shall be returned to the Contractor for disposal.

1.3 RELATED WORK

- A. Section 01108 – HEALTH AND SAFETY PROCEDURES
- B. Section 01500 – TEMPORARY FACILITIES AND CONTROLS
- C. Section 01560 – TEMPORARY ENVIRONMENTAL CONTROLS
- D. Section 02010 – SUBSURFACE INVESTIGATION
- E. Section 02095 – TRANSPORTATION AND DISPOSAL OF WASTE MATERIAL
- F. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

1.4 DEFINITIONS

- A. Authorized Excavation: Earth Excavation or "Excavation" consists of removal of materials encountered to the elevations and widths indicated in the Contract Drawings, Specifications, or as directed by the Engineer.
- B. Unauthorized Excavation: Consists of removal of materials beyond indicated sub-grade elevations or Contract defined trench limits without specific direction of the Engineer. Unauthorized excavation, handling material, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Backfill and compact unauthorized excavations as specified for excavations of the same class, unless otherwise directed by the Engineer.
- C. Area of Excavation: For the purposes of reusing soil/fill on-site, the *area of excavation* is considered to be the approximate area in which the soil/fill was removed provided that area is consistent in soil strata, color, texture, geotechnical properties and has substantially similar visual and olfactory characteristics. Soil/fill returned to the *area of excavation* shall be returned to approximately the same horizontal and vertical location from which it originated provided that it is not placed in an area that differs substantially in physical or chemical characteristics as can be observed and measured during excavation.
- D. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined for the purposes of the Contract as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix.
- E. Peat: A substance of vegetable origin, consisting of roots and fibers, moss, etc., in various stages of decomposition, and found, as a kind of turf or bog. Peat shall be considered natural soil or urban fill when it is encountered in small amounts

(layers 1-foot or less in thickness) and when it is impractical to separate the peat from the natural soil or urban fill strata. Otherwise, peat shall be considered a distinctive stratum.

- F. Soil/Fill suitable for on-site reuse: Natural soil and urban fill, which contains sufficient geotechnical properties, to be reused as backfill, as specified in Section 02210 – EXCAVATION, BACKFILL, FILL AND GRADING and on the Contract Drawings, shall be reused on site to the maximum extent practical provided it is not reused in an area, which is less contaminated. Natural soils that are free of contaminants and foreign materials or any indication of contamination, can be reused throughout the site.
- G. Fill (Urban Fill): Fill, also known as urban fill or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Material commonly associated with urban fill includes, but are not limited to; glass, brick, ash, wood fragments and other similar granular materials. Urban fill shall not include boulders, ledge, consolidated rock, asphalt, concrete, railroad timbers, rail, cobblestones or any other abandoned building materials which would preclude the disposal of the urban fill as daily cover at a landfill. Material containing less than 10%, by volume, solid waste/debris, as determined by the Engineer, shall be classified as urban fill. Material that contains 10% or more solid waste/debris by volume, as determined by the Engineer, shall be classified as solid waste.
- H. Unless specifically stated otherwise terms used in this specification are as defined in the MCP, 310 CMR 40.0006. The following definitions apply to these specifications:
 - 1. Background Conditions (Class A-1): Background is defined in 310 CMR 40.0006 as those levels of oil and hazardous material that would exist in the absence of the disposal site of concern which are either:
 - a. ubiquitous and consistently present in the environment at and in the vicinity of the disposal site of concern; and attributable to geologic or ecologic conditions, or atmospheric deposition of industrial process or engine emissions;
 - b. attributable to coal ash or wood ash associated with fill material;
 - c. releases to groundwater from a public water supply system ; or
 - d. petroleum residues that are incidental to the normal operation of motor vehicles.
 - 2. Any soil or fill material which meets the regulatory definition of "background" as defined in 310 CMR 40.0006 may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified herein and as specified in Section 02210 - EARTH EXCAVATION, BACKFILL, FILL AND GRADING. For record keeping purposes soil/fill that meet the definition of background, shall be transported under a Material Shipping Record.

3. Impacted <RCS-1 Soil/Fill (Class A-2): Any soil or fill material which contains oil or hazardous materials at concentrations greater than background levels but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Impacted soil may be reused at the *area of excavation* or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein and as specified in Section 02210 - EARTH EXCAVATION, BACKFILL, FILL AND GRADING. For record keeping purposes soil/fill that meet the definition of impacted soil/fill and do not meet the definition of contaminated soil/fill or remediation waste, shall be transported under a Material Shipping Record.
4. Contaminated Soil/Fill (Class B): Any soil or fill material which contains oil or hazardous materials at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600, except where the presence of the material is consistent with the regulatory definition of "background" as defined in 310 CMR 40.0006.
5. Any soils which contain either petroleum or chemical odor or visual indications of oil or hazardous materials shall be handled as potentially contaminated soils. Soil which does not have any evidence of contamination can be reused within the *area of excavation* without first performing laboratory analyses. Soil/fill which is staged and characterized can be reused within the *area of excavation* or elsewhere on site provided the material has been tested and has equal or less contamination than the point where it is to be reused and it is not reused beneath a permanent structure such as a building foundation. Any excavated soil/fill material which is not reused within the *area of excavation*, must be characterized prior to reuse. After analytical results are available, soil/fill shall be handled in accordance with the type and degree of contamination (if any) present in the soil/fill. Natural soils may be suitable for disposal/reuse off-site as fill provided it is tested as specified herein and demonstrated to be consistent with background conditions at the receiving site.
6. Contaminated soil/fill (including petroleum-contaminated soil/fill) which can not be reused on site shall be reused off-site, recycled, or disposed as a solid waste at an appropriately permitted facility unless it also meets the regulatory definition of hazardous waste as defined in 40 CFR part 261 or contains PCBs or asbestos. Subcategories of Class B are defined as follows:
 - a. Class B-1: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state unlined landfills.
 - b. Class B-2: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state lined landfills.

- c. Class B-3: Soil and Fill that meet all applicable criteria for in-state recycling (i.e., WSC-94-400) and/or the specific licensing requirements for the proposed in-state recycling facility.
 - d. Class B-4: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined, and unlined landfill reuse criteria as well as in-state recycling acceptance criteria, but do meet the criteria for regional thermal treatment facilities or out-of-state recycling facilities, and are not classified as a RCRA Hazardous Waste.
 - e. Class B-5: Soil and Fill that contain concentrations of contaminants that require removal to appropriately permitted disposal facilities and are not classified as RCRA Hazardous Waste.
 - f. Class B-6: Soil and fill which does not meet one of the designations above due to excessive foreign materials and/or debris that are not classified as a hazardous waste.
7. Hazardous Waste (Class C): A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Also included within the definition of hazardous waste is hazardous waste as defined 310 CMR 40.0006 and 40.CFR 261.3. Hazardous waste as defined in 40 CFR 261.3 is a solid waste that exhibits any of the characteristics of hazardous waste in excess of regulation levels presented in 40 CFR 261, subpart C and/or that is listed in 40 CFR 261, subpart D; that is a mixture of solid and hazardous waste; or that is derived from a listed waste. Subcategories of Class C shall be as follows:
- a. Class C-1: Soils classified as hazardous waste that can be readily treated on-site to eliminate the toxicity characteristic for lead.
 - b. Class C-2: Material determined to contain "listed" or "characteristic" hazardous waste constituents which cannot be readily treated on-site. This material must be transported to an out-of-state approved RCRA Subtitle C hazardous waste disposal or treatment facility under Uniform Hazardous Waste Manifest.
8. Unknown Materials: Any material, that is not readily identifiable non-hazardous waste, and has not been previously characterized or encountered during site investigation activities. Such wastes include:
- a. Unlabelled drums or containers containing material which is not readily identifiable as a non-hazardous substance.

- b. Any material, which varies significantly from material, previously observed on site and cannot be readily identified as a non-hazardous substance shall be handled as an unknown potentially hazardous substance as specified herein. Urban fill and miscellaneous debris (such as brick, ash, glass, metal, lead and petroleum impacted soil and fill regardless of the level of contamination present) or natural soil or urban fill which is impacted or contaminated with petroleum product from a known or probable source shall not be considered unknown materials.
- c. Waste material of unusual color or odor or material with indications of hazardous levels (e.g. exceeding OSHA permissible exposure limits) of contaminants as evidenced on an organic vapor monitor or other similar instrument.
- d. The Unknown material classification shall be used only in the event that an unexpected, unusual material is encountered for which special handling procedures shall be required in order to handle and characterize the material safely and in accordance with applicable regulations.

The Owner reserves the right to apply generator knowledge to classify and profile the material as a previously encountered waste or as a known waste. In the event that a material is encountered which the Contractor is uncertain as to its nature, the Owner or their representative shall inspect the material with the Contractor and direct the Contractor as to the nature of the material being known or unknown.

- 9. Special Waste: means any solid waste that is determined not to be a hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or in such chemical or physical state, or any combination thereof, so that particular management controls are required to prevent an adverse impact from the collection, transport, transfer, storage, processing, treatment or disposal of the solid waste. Asbestos and PCB-contaminated soils/fill are examples of special waste categories.

1.5 WORK INCLUDED

- A. The work to be done under this section includes managing excavated soil and fill material from areas of known contamination, if applicable, areas consistent with background conditions (i.e. areas which are not contaminated), and from other areas where contamination becomes evident during excavation. All soil/fill material excavated within the limits of the project area shall be handled in accordance with the provisions set forth in 310 CMR 40.0000 where applicable, and in accordance with all other applicable state and federal regulations and as specified herein and as indicated below. The work includes characterization for disposal/reuse purposes, field screening and segregation, staging and characterization, managing and disposing of soil and fill material excavated in the course of constructing the facilities and appurtenances including excavate from utilities and site grading.

- B. If contaminated groundwater is encountered, it shall be handled in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Any construction dewatering wastes which are discharged are subject to applicable, city, state, and federal regulations. Treatment of the groundwater shall be performed by the Contractor as required by the regulatory body (e.g. SESD, DEP, EPA/NPDES).
- C. All work at the site must be performed in accordance with all applicable federal, state, and local regulations, including, but not limited to:
1. The applicable parts of 40 CFR pertaining to the Comprehensive Environmental Response and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and the National Emission Standards for Hazardous Air Pollutants (NESHAPs) as regulated by the Environmental Protection Agency;
 2. State regulations specified in the MCP (310 CMR 40.0000), and Massachusetts General Law 21E - Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, and in 310 CMR 30.0000 State Hazardous Waste Regulations.
 3. DEP Policy #COMM-97-001 (Reuse and Disposal of Contaminated Soil at Massachusetts Landfills) and DEP Waste Site Cleanup Policy #WSC 94 – 400 (Interim Remediation Waste Policy for Petroleum Contaminated Soils).
 4. Massachusetts Department of Transportation (MDOT) regulations 49 CFR, and state transportation licenses and permits.
 5. OSHA regulations (including, but not limited to, 29 CFR 1910.1000, 29 CFR 1926, and CFR 1910.120), 40-hour Occupational Safety and Health Administration (OSHA) training (plus 8-hour refresher training) and all other applicable state and federal regulations regarding health and safety requirements.
 6. NIOSH/OSHA/USCG/EPA: “Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities” October 1985, DHHS (NIOSH). Publ. No. 85-115.
 8. Massachusetts Department of Transportation training.
 9. U.S. Army Corps of Engineers Nationwide 404 permit.
 10. General Contractor's license.
 11. Groundwater discharge permits.
 12. Excavation and/or grading permits.
 13. Special use permits.

14. Special waste haulers certificate.
15. The Contractor's Soil and Fill Management Plan and Health and Safety Plan to protect the workers and the public.

1.6 EXISTING CONDITIONS

- A. Environmental assessments have not been completed at the site. The soil and groundwater management specifications detailed herein were developed to manage all soil/fill excavated and groundwater encountered in the course of completing this contract including contaminated and non-contaminated soils and groundwater. In addition, these specifications shall be utilized in areas assumed to be consistent with background conditions as defined by the MCP and shall be handled accordingly unless there are visual or olfactory indications of contamination as determined by the Engineer, in which case the material shall be managed as potentially contaminated soil/fill.
- B. Soil characterization has not been conducted in-situ by the Engineer. Soil boring information collected by the Owner and Other is provided for reference. The Contractor is obligated to review existing environmental assessment reports and manage the soil and groundwater in accordance with applicable state and federal regulations.
- C. Excavated soil which can not be re-used on site shall either be loaded directly into containers for off-site reuse or disposal (provided the material is consistent in visual, olfactory and chemical characteristics as observed in with previous investigations including the contractor's investigations); otherwise the soil/fill must be stockpiled and covered prior to characterization and off-site reuse or disposal. Since individual disposal facilities will have different permit conditions and specific pre-characterization data requirements the Contractor is responsible for final soil characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final soil characterization is the responsibility of the Contractor and costs for securing a staging area and conducting waste characterization shall be incorporated into the Contractor's bid price for construction.

1.7 SUBMITTALS AND PROGRESS REPORTS

- A. The Contractor shall prepare and submit to the Engineer for review progress reports, records, data, shop drawings, samples, and other submittals, as outlined in Section 01300 – SUBMITTALS. The Engineer's review of any submittals shall not release the Contractor from the responsibility to perform the work as detailed in these specifications and in accordance with applicable local, state and federal regulations.
- B. The Contractor shall prepare a work plan that generally describes the work to be performed under this Section and it shall include, but not be limited to, the following construction operations:

1. Submitting a site-specific Health and Safety Plan (HASP) for the Contractor's employees, in accordance with the minimum standards set forth in OSHA 29 CFR 1910.120 and 1926. The Plan and a statement of certification shall be submitted to the Owner or Engineer and/or their representative for their records prior to mobilization.
2. Submitting all required plans, including but not limited to; the Soil and Fill Management Plan, Equipment and Personnel Decontamination Plan, Dust Vapor and Odor Plan, Air Monitoring and Quality Control Plan, a Spill and Discharge Control Plan and a Contingency Management Plan, to the Owner and Engineer and/or their representative for review at least two weeks prior to beginning any excavation work at the site.
3. Implementation of the submitted and approved plans including the establishment of the work zones (e.g., support zone, contamination reduction zone, exclusion zone (defined in OSHA 1910.120)), preparing the decontamination pad and staging areas, performing the appropriate environmental monitoring, training and medical monitoring of personnel, coordinating waste disposal and waste characterization as needed.
4. The contractor shall hire the services of an environmental professional to develop, implement, maintain, supervise, and be responsible for all soil/fill management and disposal practices during the course of this contract. The environmental professional shall be present during all excavation, backfilling, field screening, segregating, handling, disposal, and characterization of all soil/fill excavated in the course of completing this contract to ensure that soil/fill is managed in accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000).
5. Construction of a secure soil/fill staging area sized to adequately segregate soil/fill in accordance with the conditions specified without impeding construction-related activities. The Contractor shall use existing information and obtain additional information as may be needed to minimize the need for a staging area. If a staging area is required to characterize any unknown material or any soil/fill material for any reason, the Contractor shall be responsible for locating, selecting, preparing and securing the area as specified herein.
6. Managing all excavated soil/fill which originates from the elements of work included in the contract and grading activities.
7. All excavated soil and fill that is geotechnically suitable shall be reused within the *area of excavation* to the maximum extent possible.
8. Soil/fill which can not be reused immediately within the *area of excavation* or elsewhere on-site shall either have been pre-characterized for disposal by the Contractor's hired environmental professional and directly loaded for off-site transport (provided the excavated soil/fill is consistent in visual, olfactory and field screening characteristics with subsurface investigations conducted prior to construction); or it shall be staged at a location determined and secured by the contractor pending

analytical characterization. The contractor shall make all attempts to reuse excavated soil/fill on-site. Soil/fill reused within the *area of excavation* shall not need to be tested for waste characterization parameters.

9. The Contractor shall hire an environmental professional qualified to characterize all excavated soil and fill material prior to reuse or disposal. Characterization requirements may vary depending on disposal facility permits and policies. The Contractor shall be responsible for final waste characterization and shall determine in advance of submitting a bid what, if any, additional waste characterization beyond what is specified herein shall be required by the disposal facility. All other soil/fill shall be tracked under a Material Shipping Record or Bill of Lading if required.
10. Excavating unknown, previously uncharacterized material which may be classified as RCRA hazardous waste and disposal at an approved facility.
11. Excavating soil, fill and waste containing suspect asbestos-containing material if encountered (e.g., transite board, transite pipe) and disposal at an approved landfill/facility.
12. Handling, characterizing, transporting, reusing, and disposing soil/fill material.
13. Placing and grading of certified clean backfill (including all backfill from on site which is determined to be suitable for re-use). The Contractor shall maximize the reuse of on site materials by using soil/fill suitable for reuse prior to importing material on site. Proposed use of imported material shall be reviewed with and be acceptable to the Engineer prior to placement.
14. Protecting all soil/fill material exposed by excavation activities at the end of each day by using a removable and reusable cover capable of preventing dust generation and windblown transport of waste and/or contaminants.
15. Demobilizing the site, including, but not limited to, removing and disposing of construction-related equipment and materials used for personnel and equipment decontamination and related waste such as personal protective equipment, decontamination water/solids, temporary covers, and washwater storage tanks; disconnection of temporary utilities; and final clean-up to pre-construction conditions.
16. In the event that an unknown material is encountered, the Contractor shall immediately contact the Owner or the Owner's representative to discuss the nature of the unknown material and appropriate handling procedures. Unknown material shall be managed separately and shall be staged separately pending sampling and testing as specified herein.

- B. The Contractor shall provide the following at least two weeks prior to mobilizing onto the site:

1. Soil and Waste Management Plan (SWMP):

The SWMP shall outline measures for sampling, analysis, disposal, and shall identify a waste staging area in the event that soil is stockpiled for subsequent reuse and/or disposal or unknown materials are encountered. The Contractor's procedures shall be described in the Soil and Waste Management Plan. At a minimum, this plan shall address the following:

- a. A list of all transporters and waste facilities, complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor utilizes for waste disposal. In addition, a copy of a memorandum of understanding between the contractor and each disposal facility shall be attached to the Soil and Waste Management Plan. The memorandum of understanding shall detail that the disposal facility agrees to accept a specified quantity of waste as characterized in the Contract Specifications at an agreed upon price and detail what if any restrictions may apply. A copy of the facility's operating permit shall be provided in the Soil and Waste Management Plan.
- b. Disclose a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.
- c. Storage provisions for waste material.
- d. Procedures for securing the staging area, controlling dust and soil/fill migration, preventing damage to uncontaminated areas via contaminant migration and for decontaminating vehicles and personnel exiting the staging area.
- e. Methods and procedures for identifying stockpiled material (e.g., labeling, marking containers) and procedures for identification and tracking.
- f. Methods, procedures, and equipment used for obtaining the necessary information needed to satisfy the off-site reuse/disposal facility requirements specified herein an/or by the facility.
- g. Methods, procedures, and equipment used for excavating, characterizing, segregating, reusing/backfilling, loading and transportation of contaminated soil/fill materials encountered during excavation operations.

- h. Methods, procedures, and equipment proposed for assessing and handling unknown materials in accordance with the contractor-prepared contingency management plan.
- i. Provisions for separation of incompatible materials.
- j. Protocol for overpacking drums (if encountered).
- k. Procedures for consolidating (i.e., bulking) compatible materials for disposal.
- l. Procedures for entering the storage area(s) (e.g. sampling stockpiled waste materials in staging area.)
- m. Prior to off-site disposal or reuse, the Contractor shall provide to the owner a letter from the disposal facility indicating that the facility has reviewed the available data relative to the soil/fill to be delivered and agrees that the soil/fill meets their acceptance criteria. The letter shall be signed by a duly authorized representative of the receiving facility.

2. Contingency Management Plan (CMP):

The CMP shall provide details on construction methods, and site location and availability of the staging area(s) for approval by the Owner or Engineer and/or their representative. At a minimum, the CMP shall include provisions for the following:

- a. Details on the Contractor's CMP for temporarily staging unknown materials pending characterization. The staging area shall be prepared, tested, lined and bermed as specified .
- b. Maintenance requirements for the staging area(s).
- c. Any additional storage, handling, characterization and disposal requirements.
- d. The Contractor's plan for notifying the Owner and Engineer in the event of an emergency or in the event that an unknown material as defined in this specification is encountered. The plan shall include the phone numbers and names of the Owner's representative(s) that the Contractor would contact in such an event.

3. Spill and Discharge Control Plan (SDCP):

This SDCP shall provide contingency measures and reporting responsibilities for potential uncontrolled spills and discharges of contaminated and/or hazardous materials, including, but not limited to, leachate, decontamination water, sewage, and other on-site waste

materials. In addition to the above listed items, the SDCP shall specifically contain:

- a. Procedures for containing dry and liquid spills.
- b. Absorbent material available on site.
- c. Storage of spilled materials.
- d. Reporting (i.e., notification) procedures.
- e. Decontamination procedures.
- f. Discharges of sanitary or combined sewers into storm drains either by flow handling/bypassing or accidental or unintentional discharge.
- g. Procedures for protecting waterways and surrounding public and private property.

At a minimum, the Contractor shall maintain on-site absorbent pads, booms and absorbent materials sufficient to address a release of fuel oil, hydraulic oil or any other hazardous materials that the Contractor intends to use or store on site, including fuel oil and hydraulic oil that is used within earth moving equipment. The quantity of spill containment materials maintained on site shall be sufficient to respond to a catastrophic release from the vessel containing the greatest quantity of oil or hazardous material on-site. The Spill and Discharge Plan shall indicate the location and quantity of the materials to be staged on site and the basis for the quantities (i.e. indicate the vessel which will be on site containing the greatest volume of oil or hazardous materials). No fuel or oil tanks or drums may be temporarily staged on site unless they are stored within a secondary containment system. Fuel deliveries must be performed in a designated area which has either secondary containment or upon an impervious surface with absorbent berms located around the point of fuel delivery. The Spill and Discharge Plan shall indicate the location of the fueling area and the nature of secondary containment which the Contractor intends on utilizing.

4. Spill Incident Report:

A written report detailing the uncontrolled spill or discharge shall include, at a minimum, the cause and resolution of incident, outside agencies involved, and date occurred. The report shall be submitted to the Owner within 48 hours of the incident. The Contractor shall document all spills on the as-built Drawings and submit the Drawings to the Owner at project completion. The Contractor shall be responsible for remediating any spills or releases of oil or hazardous materials as a result of the Contractor's activities. The site shall be remediated to pre-release conditions at no additional cost to the Owner.

5. Notification Procedures:

The Owner shall be notified immediately of an uncontrolled spill or discharge. If human health or the environment is threatened, the Contractor shall take immediate action to abate the conditions and notify emergency personnel. In the event of an emergency, the Contractor shall contact the following entities at the earliest possible opportunity:

- a. Owner's designated representatives.
- b. City of Salem, Engineering Department
- c. City of Salem Fire Department
- d. Engineer
- e. Massachusetts DEP.

The Contractor shall prepare in advance of work activities a notification list, complete with phone numbers, addresses, and contact names for all parties to be notified (including, but not limited to, the parties listed above) in the event of a spill.

6. Dust, Vapor, and Odor Control Plan (DVOCP):

The DVOCP shall include measures to control objectionable dust, vapors, and odors originating from the site. The DVOCP shall describe procedures to minimize the creation of dust, and the control of objectionable vapors and odors originating from the site. Refer to requirements in Section 01560 – TEMPORARY ENVIRONMENTAL CONTROLS.

7. Equipment and Personnel Decontamination Plan (EPDP):

The EPDP shall indicate the means and methods for decontaminating all equipment and personnel. The EPDP shall also include provisions for installing the equipment decontamination pad in accordance with the Contract Specifications.

- C. In all cases, including soil and fill disposal, except where otherwise specified by law, the Contractor shall be responsible for the signing of manifests. Should the Owner need to sign disposal documentation, the Contractor shall be responsible for preparing the documentation (including LSP Opinions prepared at the request of disposal facilities, manifests and Bills of Lading) and obtaining all necessary information and signatures required to complete the documentation. The Contractor shall be responsible for the storage and disposal of these materials in accordance with applicable laws and regulations, including the terms and conditions in this contract.

1.8 QUALIFICATIONS

- A. The Contractor shall demonstrate the necessary skills, experience, training, and qualifications to conduct the work herein specified. In addition the Contractor shall provide the qualifications of each disposal facility that the Contractor intends to use to dispose of non-hazardous solid waste; and if necessary to

dispose of hazardous waste (due to lead toxicity); PCB impacted waste and asbestos-containing waste.

- B. The Contractor shall hire an Environmental Professional to be assigned to this project to execute the responsibilities detailed in these specifications. The Environmental Professional shall be sufficiently versed in soil characterization, DEP regulations and policies to execute the work as specified. The Contractor shall provide the qualifications of the Environmental Professional to be assigned to this project. The Environmental Professional shall be at a minimum certified, registered or licensed as an Environmental Professional or equivalent and contain a Bachelor of Science Degree in Environmental Science, or Environmental Engineering, or Public Health or related degree and have sufficient experience in similar work to perform the responsibilities detailed herein.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Clean Backfill - Analytical Results: The Contractor shall provide certification that imported topsoil and backfill is free of contaminants. Certification must indicate the point of origin (i.e. where the material was excavated or originated from) and include laboratory analytical results as specified in Section - 02210 EARTH EXCAVATION, BACKFILL, FILL AND GRADING. The Contractor shall provide a statement that the sample results are representative of the material being provided and that the material is free of organic, or any other unsuitable contaminants and that metal concentrations are consistent with background levels.
- B. Stockpile Covers: Excavated materials shall be completely covered with a minimum 10 mil thickness polyethylene tarp and secured with tires, ropes, anchors or equivalent material. The covered system shall be capable of resisting actual wind gusts at the site, with a minimum wind capacity of 40 miles per hour. The stockpile covers shall be installed and secured at the end of each working day and at all times when earthwork is not taking place on site. Stockpile covers shall be immediately recovered should wind forces expose any of the excavated materials. Stockpiles shall also be covered at times as directed by the Engineer. Excavated materials shall be completely covered with a minimum 10-mil-thick layer of polyethylene tarp at the end of each working day.
- C. 20 mil Polyethylene Liner: Staging areas for all excavated material shall be lined with 20-mil-thick polyethylene liner in an area designated by the Contractor and agreed to by the Owner.
- D. Waste Disposal Documentation: Completed Bills of Lading, manifests, certificates of disposal and all other documentation relative to disposal of waste material.
- E. Decontamination Pad: The Contractor shall provide all materials and labor to complete a decontamination pad as specified herein. Liner materials, and collection system shall be selected by the Contractor to perform as specified.

PART 3 – EXECUTION

3.1 GENERAL

- A. All work in this section shall be performed in accordance with the technical specifications detailed herein and the Engineer-accepted Soil and Fill Management Plan and Health and Safety Plan that has been prepared and submitted by the Contractor.
- B. The primary concern of the Contractor in the excavating, handling, sampling, bulking, disposal, and on-site storage of soil/fill and/or drummed material (if encountered) shall be to protect the health and safety of the site workers, public, and the environment.
- C. The Contractor shall keep a copy of the Health and Safety Plan (HASP) on site during all operations and shall conduct routine health and safety meetings. Failure to keep a copy of the HASP on-site, or any other breach of the Contractor's Plan, shall be cause for stopping work. Delays caused by the Contractor's failure to comply with the health and safety regulations or any health and safety plan shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are implemented and accepted by the Engineer and/or their representative.
- D. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's safety and health program for personnel working on the site (who are subject to exposure to potentially contaminated soil/fill) shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer and/or their representative.
- E. The Contractor shall make available Level C personal protective equipment and clothing, not including respirators, to the Engineer or Owner and/or their representative for use during site visits by the Engineer and/or their representative, up to a maximum of three complete sets per day. 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). The Contractor shall provide a repository for collection of expendable and disposed health and safety materials. Collection and disposal of contaminated expendable supplies shall be the Contractor's responsibility.
- F. The level of dermal and respiratory protection shall be determined based upon continuous air monitoring to be performed by an environmental professional hired by the Contractor. The Engineer or Owner or their representatives may conduct duplicate air monitoring for quality control purposes. As air monitoring indicates the levels of contaminants in the air, the required personal protective equipment shall be determined based upon established standards and the standards set forth in the Contractor's health and safety plan. Regardless, Level

D protection (as defined by OSHA regulations 29 CFR 1910.120) for all on-site personnel is the minimum project requirement.

- G. The Contractor shall be aware of site-specific requirements, such as site security during non-working hours, limited work space, and minimizing the effects of soil/fill excavation, in preparing its health and safety program.

3.2 SOIL/FILL CHARACTERIZATION

A. Initial Characterization, Excavation and Handling of Soil/Fill Material Program

1. Soil characterization and analysis have not been completed by the Owner. Soil boring information collected by the Owner and Others is provided for reference. The Contractor shall review the information provided.
2. Soil/fill, which cannot be reused on site, shall be subject to reuse off site or disposal as specified herein. During construction activities excavated soil/fill shall be field-screened by the Contractor hired Environmental Professional and either loaded directly for off-site disposal (provided the excavated material is consistent with previously conducted investigations); or stockpiled in a soil/fill staging area located by the Contractor and approved by the Owner. (Note: The soil/fill shall not be staged within 100 feet (30.5 meters) of a Reservoir or Area of Critical Environmental Concern. Soil/fill shall not be staged in public areas such as roadways or sidewalks over night). Contaminated material requiring additional waste characterization due to waste disposal facility requirements or in order to assess unknown materials, shall be staged pending analytical sampling and characterization by the Contractor's hired environmental professional. All stockpiles shall be covered and maintained as specified herein.
2. Distinctive soil/fill strata shall be segregated based on geotechnical properties, visual, olfactory, and field characterization results utilizing a Photo-Ionization Detector (PID) and DEP jar headspace measurement protocols by the Contractor's Environmental Professional. Similar material shall be grouped together. Soil/fill which can be reused within the *area of excavation* shall be returned to the *area of excavation*. Soil/fill which cannot be reused within the *area of excavation* in the same day shall be staged until such time that it can be reused within the *area of excavation* or elsewhere on site. Soil/fill which can not be reused within the *area of excavation* shall either be pre-characterized or staged pending characterization. Depending upon the analytical test results, the soil/fill shall either be reused on site or disposed/reused off-site. Soil/Fill strata shall be initially segregated as follows:
 - a. Probable Class A-1 Material: Soil/Fill that does not have any visual or olfactory indication of contamination and has a jar headspace screening result less than 5 parts per million (ppm), as measured by a PID calibrated to benzene equivalents. This material can be reused within the *area of excavation* without additional testing. If it is to be reused as fill on-site at a location

other than the *area of excavation* or off-site as fill it must be staged and tested by the Contractor. This material is to be sampled separately due to the probability of an absence of contamination. If test results confirm the absence of contamination this material is to be segregated during construction activities as suitable for re-use on site as backfill (provided it meets Contract Specifications) or it may be used at any location where it is consistent with background conditions. Provided analytical results support the determination of no contamination this material does not have to be disposed or transported under a Massachusetts Bill of Lading.

- b. Probable Class A-2 Material: Soil/Fill that exhibits low visual or olfactory indications of contamination (i.e. less than 5% by volume of foreign materials or by a faint foreign odor) and is suspected of containing low levels of contamination (i.e., impacted soil/material which has constituent(s) above background levels but below DEP Reportable Concentrations [RCS-1]) shall be separated as probable Class A-2 material. Soil with jar headspace results between 6 and 10 ppm, and/or contains a low level of foreign material as evidenced visually or by olfactory techniques shall be placed in this category. This material is to be sampled separately due to the probability of containing either low or no levels of contamination. The analytical results shall determine the final reuse/disposal option.
- c. Probable Class B-1/B-2 Material: Soil/Fill suspected of having moderate levels of contamination (i.e., equal to or greater than the applicable reportable concentration but suitable for reuse at a licensed in state landfill as daily cover). This category shall include soil and fill with jar headspace results between 10 ppm and 100 ppm or soil containing significant visual (i.e. > 5% but less than 10% foreign material by volume) or olfactory evidence of contaminants. This material is to be sampled separately due to the potential of exceeding DEP's reportable concentrations but within the guidelines for reuse as daily cover at a landfill. The analytical results shall determine the final reuse/disposal option.
- d. Probable Class B-3 through B-6 Material: Soil/Fill suspected of having high levels of contamination (i.e., equal to or greater than the applicable reportable concentration but suitable for disposal at a licensed non-hazardous solid waste facility). Soil with jar headspace results greater than 100 ppm or soil containing significant visual (i.e. >10% foreign material by volume) or strong olfactory evidence of contaminants. This material is to be sampled separately due to the potential of exceeding DEP's guidelines for reuse as daily cover at a landfill and requiring either recycling at an asphalt batch plant or as solid waste at an appropriately permitted disposal facility. The analytical results shall determine the final reuse/disposal option.

- e. Probable Class C Material: Soil/Fill suspected of being a hazardous waste as defined by the Resource Conservation and Recovery Act or the Toxic Substances and Control Act. Material with visually gross levels of contamination, including free product or containing evidence of hazardous constituents including but not limited to indications of tannery wastes or coal tar or any other waste which may contain elevated levels of pollutants, shall be placed in this category. This material is to be sampled separately due to the potential of exceeding RCRA or TSCA hazardous waste thresholds requiring disposal at an appropriately permitted hazardous waste facility.
- f. Probable Asbestos Containing Material: Soil/Fill suspected of containing asbestos as evidenced by the presence of suspect asbestos-containing building debris such as cementitious piping, vinyl floor tiling, roofing paper or paper-like insulation materials or any other suspect asbestos containing material observed in the soil/fill.
- g. Unknown Material. Any material, soil or fill that is not readily identifiable as non-hazardous waste, and has not been previously characterized or encountered during site investigation and Work activities. Such wastes include; unlabelled drums or containers containing material which is not readily identifiable as non-hazardous substances, any material which varies significantly from material previously observed on site and can not be readily identified as a non-hazardous substance shall be handled as an unknown potentially hazardous substance as specified herein. Previously encountered material shall include but not be limited to urban fill and miscellaneous debris (such as brick, ash, glass, metal, lead and petroleum impacted soil and fill regardless of the level of contamination present).

If there is more than one type of soil/fill strata with varying degrees of geotechnical properties, additional segregation shall be performed.

B. Final Waste Characterization of Soil/Fill Material

- 1. Final waste characterization shall be the responsibility of the Contractor. The Contractor shall be responsible for determining the disposal facility(ies) characterization requirements in advance to facilitate timely disposal and to adequately estimate the disposal costs. The Contractor shall perform additional segregation based on disposal requirements. Disposal or reuse of the material shall depend on sampling and characterization analytical results. At a minimum, each stockpile shall be sampled for Total Petroleum Hydrocarbons, Volatile and Extractable Petroleum Hydrocarbons with Polyaromatic hydrocarbon (PAH) quantification and for Total RCRA 8 Metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag) in accordance with current industry standards for waste analysis.

2. Stockpiles within the staging shall be sampled and characterized within a timely manner so as not to impede construction activities or preclude the reuse of soil/fill on site. If soil/fill cannot be reused on site due to the Contractor's delay in sampling material, the Contractor shall dispose of the soil/fill at no additional cost to the Owner. The cost of furnishing and installing imported fill material used in its place shall also be at no additional cost to the Owner.

C. Contingent Materials Characterization (i.e. Characterization of Unknown Materials)

If unknown material is encountered during excavation, the Contractor or the contractor-hired Environmental Professional shall immediately contact the Owner and Owner's representative to discuss the nature and extent of the unknown material and to assess potential hazards and appropriate handling procedures. The material shall be segregated from other soil and solid waste material. Prior to handling and removing the unknown material from the excavation area, the Contractor and Owner and/or its representatives, shall visually assess the material and its potential hazards. Drummed material shall be assessed to determine whether it is leaking, bulging, crushed, or empty. Crushed, empty, and/or skeletal parts of drums shall be handled as solid waste, as specified. In addition, the drums shall be inspected for signs of reactive waste (e.g., bulging drum, specialty metal drum). The Contractor shall record any identification or markings on the drummed materials. An information sheet shall be developed as part of the Contractor's Soil and Fill Management Plan, upon which the Contractor shall record information such as container type, size, and condition; type of materials being stored; and any identifying characteristics of the material being stored. The format of the information sheet shall be as approved by the Owner and/or its representatives.

1. If additional characterization is required because unknown materials are encountered or temporary staging is needed for any reason the staging area shall be secured and prepared as specified herein. Stockpiles shall be characterized as necessary by the Contractor's Environmental Professional to satisfy the disposal facility's pre-characterization requirements. In addition, stockpiles of unknown material shall require characterization, as specified below:
2. Unknown material shall be fully characterized prior to disposal. At a minimum, the Contractor shall use the following EPA methods (unless more current methods have been adopted and approved by the EPA) for characterizing potentially hazardous or unknown material samples:
 - a. Ignitability - EPA 1010
 - b. Corrosivity - EPA 9040/9045
 - c. Reactivity:
 - 1) Cyanide - EPA 9012
 - 2) Sulfide - EPA 9030
 - d. Free Liquids - EPA 9095
 - e. Pesticides for liquid drummed material only - EPA 8081/8140
 - f. PCBs - EPA 8082

- g. Solid Waste Profile Characterization:
 - 1) Total Semi-Volatiles - EPA 8270
 - 2) Total Volatiles - EPA 8260
 - 3) Total Pesticides - EPA 8081
 - 4) Total Herbicides - EPA 8150
 - 5) Total RCRA 8 Metals - EPA 6000 and 7000 series
 - 6) Total Petroleum Hydrocarbons (EPA 8100)
 - 7) VPH/EPH Methodology as specified by MA DEP Policy.
- h. RCRA Toxicity:
 - 1) Toxicity Characteristic Leaching Procedure (TCLP) Preparation - EPA 1311
 - 2) TCLP Semi-Volatiles - EPA 8270
 - 3) TCLP Volatiles - EPA 8260
 - 4) TCLP Pesticides - EPA 8081. Only solid drummed material shall be analyzed for the TCLP pesticides because liquid drummed material is tested for pesticides using EPA 8081/8140.
 - 5) TCLP Herbicides - EPA 8150
 - 6) TCLP Metals - EPA 6010 and 7470

D. Disposal Facility Characterization Requirements:

- 1. Additional characterization requirements may vary, depending on disposal facility permits and policies. The Contractor shall be responsible for determining the disposal facility(ies) characterization needs in advance to facilitate timely disposal and to adequately estimate the disposal costs. Transportation of the wastes shall be accompanied by the appropriate manifests such as a Massachusetts DEP Bill of Lading, as required in 310 CMR 40.0030, a Waste Material Shipping Record or by a Uniform Hazardous Waste Manifest.

E. Characterization of Potential Asbestos-Containing Material:

- 1. Although no asbestos-containing material has been discovered on site to date, it is not uncommon to encounter such material at sites consistent with the historical development of the area.

To the degree that suspect asbestos-containing materials (e.g., tiles, asbestos-cement pipe or shingle, or any other suspect asbestos-containing material) are encountered, it shall be segregated, stockpiled separately, and tested for asbestos content using Polarized Light Microscopy. Workers handling suspect asbestos-containing materials shall be properly trained and equipped to handle asbestos materials.

- 2. Materials which test positive for asbestos (i.e. greater than 1% asbestos) shall be handled in accordance with the provisions set forth in Salem Ordinance 8.61.040. The Contractor shall include one or more of the dust mitigation and assurance measures specified in the Ordinance. At a minimum the Contractor shall adequately wet soil/fill during soil/fill disturbance activities. Additional mitigative measures as specified in

8.61.040c shall be initiated if the conditions set forth in the ordinance become present. Asbestos-containing material shall be disposed at an appropriately permitted facility.

3.3 FINAL CHARACTERIZATION OF SOIL AND FILL MATERIAL

- A. All excavated soil/fill that is geotechnically suitable for reuse shall be reused within the *area of excavation* or elsewhere on site to the maximum extent possible before being stockpiled or disposed off-site. Reuse of geotechnically suitable material at the *area of excavation* will not require analytical characterization. In no case can potentially contaminated material be used in an area which is either clean or not as contaminated as the material being used for backfill. The Contractor-hired environmental professional shall be present to direct soil/fill handling activities including segregating soil/fill consistent with field observations and/or the findings of the pre-characterization program. Excavated material shall be tracked to avoid cross-contamination of non-impacted areas. If contaminated material must be moved from the *area of excavation*, it shall be staged and handled in accordance with field screening observations and characterization data.
- B. Following receipt of analytical test results, excavated soil/fill are expected to be segregated into the following categories:
 - Class A-1
 - Class A-2
 - Class B-1
 - Class B-2
 - Class B-3
 - Class B-4
 - Class B-5
 - Class B-6
 - Class C-1
 - Class C-2
 - Asbestos-Containing Soil/Fill
 - PCB-Contaminated Soil/Fill
- C. The Contractor shall perform additional segregation based on disposal facility requirements.

3.4 STAGING AREA

- A. Excavated material requiring additional waste characterization shall be staged in a designated upland area(s) selected by the Contractor and agreed to by the Owner. The Contractor shall select an area(s) that will not impair or impede construction activities. The staging area(s) shall be readily accessible and sized to adequately stage material pending either transport to an interim staging area(s) for characterization sampling and analysis or transported directly to the disposal facility. The staging area shall be secure from pedestrian traffic and be enclosed by an eight-foot fence with a lockable gate.

- B. Prior to staging any materials the Contractor shall pre-characterize the surface soils (0-6") at the staging area(s) to document the existing conditions. A minimum of two surface soil samples or one surface soil sample for every 2000 square feet (185.8 square meters) of staging area (whichever is greater) shall be collected by the Contractor prior to staging materials at the location unless the staging area is comprised of an impervious surface material such as asphalt or concrete; in which case the Contractor shall sample an equivalent area as determined by the Engineer. Equivalent areas may include adjacent areas or nearby catch basins/storm drains. The samples shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), and petroleum hydrocarbons (EPA Method 8100).
- C. The Contractor shall re-sample the staging area(s) at the same location, depth and frequency as conducted prior to staging materials, after removal of all staged materials, to assess any impact from using the area to stage soil/fill or unknown materials. The sample(s) shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082).
- D. If there is a significant increase in contamination reported in the staging area following use by the Contractor, the Contractor shall remediate the staging area to pre-existing conditions. For the purposes of this Contract a significant increase shall be defined as any detection of a contaminant that was not previously detected and was a known constituent in the soil stockpiled within the staging area, or a ten-fold increase in any contaminant, or an increase of any contaminant that was previously below a DEP reportable concentration but is later reported above the reportable concentration.
- E. Stockpiles located within the soil/fill staging areas shall be placed on a 20-mil HDPE liner/filter fabric unless soil is placed on asphalt or concrete surface and bermed to prevent any contamination of the staging area. The berms shall be made a minimum of 2 feet (609.6 mm) above the existing grade with concrete barriers, hay bales or equivalent berm material. Berms shall not be constructed of excavated soil/fill. Waste characterized as RCRA hazardous waste shall not be stored on site for a period greater than sixty (60) days. All other waste must be disposed off-site or reused on site within ninety (90) days of excavation. At the end of each working day, contaminated soil/fill shall be covered with 10-mil polyethylene to minimize the potential for release of contaminants.
- F. Stockpiles shall be segregated based on visual, olfactory, and field screening results. Similar material may be stockpiled together; however, no stockpile shall be greater than 1000 cubic yards (764.555 cu. meters) or have a total height greater than 12 feet above the base of the stockpile. Each stockpile shall be clearly separable from adjacent stockpiles. Furthermore, the contractor shall not have an aggregate of more than 5,000 cubic yards stockpiled on-site at any one time.

- G. Stockpiles shall be clearly designated by a signpost or marker that can be cross-referenced with samples collected from the pile for characterization purposes. The signs/markers shall not be moved, except by authorized personnel and not until the soil/fill is ready to be either reused on site or loaded for off-site disposal.
- H. Separate staging areas shall be constructed to handle potentially hazardous soil/fill, debris and drummed materials or unknown materials encountered during the project. The Contractor's Soil and Fill Management Plan shall provide construction details of the dimensions and protective measures proposed for the staging area(s). The construction details and protective measures shall be subject to the approval of the Owner and/or its representatives. The Contractor shall select the area to facilitate handling of the material and to minimize interference with other ongoing construction activities.

3.5 UNKNOWN MATERIALS AND SUSPECTED HAZARDOUS WASTE STORAGE AREA

- A. If necessary, the Contractor shall construct a separate staging area for unknown materials. The staging area shall be prepared pre-characterized, lined and bermed as specified above. The Contractor shall use 10-mil-thick polyethylene to cover potentially contaminated waste stockpiles or use approved roll-off containers.
- B. The Contractor shall use only rubber-tired equipment when handling drummed or suspect asbestos containing material. Drummed material shall be staged such that cleaning, labeling, opening, sampling, bulking, and initial storage of materials occurs in the drum staging area. Drummed waste shall be segregated (i.e., organized into different areas within the drum/material staging area) to facilitate opening, sampling, characterization, and bulking. Individual drums shall be handled in accordance with EPA drum handling procedures and positioned such that the labels are clearly visible.
- C. The Contractor shall furnish the necessary monitoring, emergency, and material handling equipment for the drum handling area, as required. The Contractor shall submit for approval, as part of the Soil and Fill Management Plan, a detailed description with drawings, if necessary, of the proposed location and construction and covering procedures for the drum/material handling and staging area. All spill control measures shall be implemented as specified in the Contractor-prepared, Spill Discharge and Control Plan.
- D. This area shall be used for preliminary assessment of the unknown materials. The Contractor shall furnish this staging area with the necessary monitoring, emergency, and material handling equipment (e.g., overpacks, absorbent, shovels, fire suppressants), as required. Water tight hazardous waste roll-off containers may be used in lieu of establishing a lined and bermed staging area provided the containers are covered and do not accumulate rain water.

3.6 EQUIPMENT AND PERSONNEL DECONTAMINATION

- A. The Contractor shall establish a site-specific decontamination protocol for personnel and equipment utilized at the subject site. The Contractor shall

construct and maintain personnel and equipment decontamination areas for the proposed work. The Contractor shall decontaminate personnel and all construction and ancillary equipment in the Contamination Reduction Zone (CRZ) as it leaves the contaminated zone, prior to it entering the Clean/Support Zone (SZ). The Contractor shall have the decontamination protocol as part of its site-specific HASP.

- B. The decontamination protocol shall include;
 - 1. The means, methods, and materials for the proposed decontamination procedures;
 - 2. The procedures employed to contain and store the wash or rinse liquids/sludges;
 - 3. Procedures used to sample, analyze, and characterize the contaminated wash or rinse liquids/sludges;
 - 4. Procedures to contain or clean contaminated personal protective equipment and clothing;
 - 5. The procedures for handling and disposing of solid wastes generated from site decontamination activities;
 - 6. Provide a sketch showing how the decontamination area will be set up and where it will be located.
- C. All sample analysis or sample compositing shall be completed by a Massachusetts-certified laboratory. The Contractor shall be responsible for the cost of this analytical work. The Contractor shall submit a copy of the analytical results and laboratory certifications to the Owner for review prior to proceeding with disposal. The Contractor shall be responsible to properly manifest and dispose of all residual wastes generated from on-site activities in conformance with federal, state, and local environmental and transportation regulations. The Contractor shall be responsible for the manifests and procedures to be used to package and dispose of contaminated solid wastes, wash, or rinse liquids at an EPA or state-approved treatment or disposal facility. The Contractor shall be responsible for any releases from site or decontamination activities due to its work, and shall remediate any release for which the Contractor is responsible to pre-existing conditions at the contractor's expense.
- D. An equipment and personnel decontamination area, conforming with the Contractor's HASP and these Specifications, shall be constructed in such a manner to protect existing site surfaces, materials, and structures from contamination. The area shall be sized adequately to provide for the decontamination of the largest piece of equipment to be decontaminated. Filter fabric shall be placed over an impermeable liner to protect the liner from rips, punctures, or tears from traffic and heavy equipment.
- E. Trucks leaving the site shall be required to pass through the decontamination pad with a wheel wash or for vehicles that do not enter a contaminated zone shall

pass through a wheel wash station prior to exiting the site to remove soil and debris. No truck shall leave the site until all free water is drained from the loading bed. The Contractor shall be responsible for removing any water, mud, dirt, soil or debris tracked off the site immediately upon occurrence. The Project Area and surrounding truck routes shall be kept clean through periodic use of a Sweeper Truck. The Sweeper Truck shall be used daily or more frequently as required to keep soil/fill and water from the street.

- F. Splash guards or side panels shall be installed along the decontamination pad as necessary to prevent over-spray and wash water from exiting the decontamination area.
- G. Provisions for collecting decontamination water shall be incorporated into the maintenance of the decontamination pad and shall include placing an impermeable liner over a sloped surface such that water is directed, if necessary, into an area for subsequent pumping to 55-gallon drums or other appropriate tankage. Following completion of the work, the wash water shall be characterized by the Contractor and disposed off-site, in accordance with federal, state, and local regulations.

3.7 ENVIRONMENTAL FIELD MONITORING

- A. During construction, the Contractor shall conduct environmental air monitoring immediately around the areas where construction activities involve soil/fill handling such as excavation, re-location, staging, loading or grading of soil/fill and/or waste materials. Air monitoring shall involve direct reading instruments capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. The frequency of air monitoring shall be as specified herein and as determined by an Industrial Hygienist or qualified environmental health professional hired by the Contractor. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for ensuring that monitoring is conducted in an appropriate manner, and that work practices, engineering controls and/or Personal Protective Equipment are proper for the conditions.
- B. The air-monitoring program shall be designed to protect public health and the environment from the potential generation of dust and contaminant release during work. At a minimum, the air monitoring shall include daily monitoring and documentation of one upwind, and two downwind conditions from each location where there is a potential for dust being generated. The air monitoring information including air monitoring in the vicinity of all site activities shall also be utilized for establishing levels of personal protection measures in the Contractor's Site Specific Health and Safety Plan. The Contractor shall submit an air quality monitoring program for review and comment prior to commencement of site activities.
- C. Air monitoring shall be performed by the Contractor during all soil/fill-handling operations. At a minimum, detectors for organic contaminants and dust should be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g. excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring

information by the Contractor. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions and personnel protection measures.

- D. The Contractor shall hire an Environmental Professional to keep accurate documentation of all air monitoring, which shall be made available to the Engineer or Owner upon request.

3.8 DUST CONTROL

- A. The Contractor shall refer to Section 01560 – TEMPORARY ENVIRONMENTAL CONTROLS for Dust Control requirements in addition to the requirements listed below.
 - 1. All containers temporarily storing waste material shall be covered at all times except as necessary to place waste material into the container. The Contractor shall inspect the covers daily to ensure the covers are in place and effectively eliminating the generation of dust and make appropriate notes in the site log.
 - 2. All stockpiles of waste material shall be covered at the end of the day with a polyethylene sheeting, a minimum of 10-mil-thick, to eliminate the generation of dust. The Contractor shall be responsible for inspecting the covers daily to ensure the covers are in place and effectively eliminating the generation of dust. Water shall not be used on stockpiles to reduce the generation of dust.

3.9 VAPOR AND ODOR CONTROL

- A. The Contractor shall provide the materials and labor to control objectionable vapors and odor in accordance with the Contractor's Vapor and Odor control Plan. The Contractor shall limit the exposure area and shall cover the exposure area with synthetic reusable covers, lime, foam suppressants, or other methods to reduce off-site odors to acceptable levels. The Contractor shall not use suitable soil material as cover to control vapor and odors.

3.10 BULKING

- A. Following characterization and compatibility testing of waste material, the Contractor shall place compatible materials into common containers to reduce transport and disposal costs. In addition, materials that are improperly contained shall be transferred into the appropriate containers. Drums and containers used during this project shall meet the appropriate DOT, OSHA, and EPA regulations for the materials contained. The Contractor shall describe the bulking procedures in the Soil and Fill Management Plan.

3.11 CONTAMINATED LIQUIDS

- A. The Contractor shall collect and properly dispose of contaminated liquids and other liquids generated or encountered on site during construction. Contaminated liquid sources include groundwater encountered during excavation,

decontamination water, and drummed liquids encountered during excavation. Contaminated liquids shall be handled in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.0040 as well as all other applicable regulations. Any construction dewatering wastes which are discharged shall be subject to applicable state and federal regulations. The Contractor shall be responsible for treating the groundwater as required by applicable regulations depending upon the discharge method utilized by the Contractor.

3.12 SEDIMENTATION AND EROSION CONTROL

- A. The Contractor shall plan and execute all operations, particularly those associated with excavation and backfilling, in such a manner as to prohibit excavated and exposed soil/fill or other foreign material to be washed or otherwise carried into streets, drains or waterways. The water quality of waterways, or storm drains shall not be degraded due to construction operations.
- B. It is the intent of these Specifications to prevent the unnecessary occurrence of sedimentation or siltation of storm drains and watercourses. In the event that sedimentation or siltation prevention measures used by the Contractor prove to be inadequate the Contractor shall be required to adjust his operations to the extent necessary to prevent any such sedimentation or siltation from occurring. Any damage or degradation caused by inadequate controls shall be repaired and restored to pre-existing conditions by the Contractor at no additional cost to the Owner.
- C. The Contractor shall keep drains, streams and other water crossings clear of mud, silt, debris, or other objectionable materials resulting from construction operations.
- D. The Contractor shall use temporary vegetation and mulching to protect areas exposed during construction. The contractor shall minimize the amount of bare earth exposed at any one time during construction, and minimize the length of time bare earth is exposed.
- E. Baled hay and filter materials shall be placed to form temporary water stops, dams, diversions, dikes, berms, and for other uses connected with water pollution control. As directed by the Owner and/or their representative, bales shall be disposed by the Contractor as best suits field conditions and requirements.
- F. On sloping terrain, hay bales shall be used to trap sediment until vegetation has become established. The details of their placement shall be incorporated into the Erosion and Sedimentation Control Plan, as approved by the Owner or Engineer.
- G. Sediment-laden water that is being pumped from the trenches or excavations shall not be pumped directly into storm drains or watercourses. Sedimentation tanks or other means acceptable to the Owner or Engineer shall be used for this purpose.
- H. All excavated soil/fill shall be handled in accordance with the Contractor-prepared, Owner or Engineer -accepted, Soil and Fill Management Plan.

3.13 OFF-SITE DISPOSAL OF WASTE MATERIALS

- A. Material determined to be unsuitable for on-site reuse shall be transported and disposed as specified in Section 02095 – TRANSPORTATION AND DISPOSAL OF WASTE MATERIAL

by a licensed hauler to an appropriately permitted disposal facility. The waste shall be accompanied by the appropriate manifests and bills of lading as required by state and federal regulations. No payments shall be issued for waste which is not fully documented and certified as disposed. Disposal shall be in conformance with all local, state, and federal regulations, particularly EPA and DEP waste disposal regulations.

- B. The Contractor shall provide for the proper collection, handling, and disposal of decontaminated materials and liquids resulting from construction operations at the site. Disposal shall be in conformance with federal, state, and local regulations.

3.14 BACKFILLING AND COMPACTION

- A. Excavated areas shall be backfilled with appropriate backfill material (including excavated material suitable for reuse and, when necessary, imported off-site material). Any off-site backfill used in excavated areas shall be in accordance with these specifications, and which has been tested and certified as free of contaminants and as specified in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING. In order to minimize the volume of imported clean fill used on the site the Contractor shall use on-site soil/fill to the maximum extent possible which has been determined suitable for reuse.

END OF SECTION 02080

SECTION 02095

TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Furnish all labor, materials, equipment, and incidentals required to transport waste material off site, and dispose, reuse or recycle excess soil or waste materials at a licensed facility approved by the Owner.
- B. All personnel involved in the transportation of waste from the site shall have the required Massachusetts Department of Transportation (DOT) and Occupational Safety and Health Administration (OSHA) training.

1.2 RELATED WORK

- A. Section 01108 – HEALTH AND SAFETY PROCEDURES
- B. Section 01500 – TEMPORARY FACILITIES AND CONTROLS
- C. Section 02010 – SUBSURFACE INVESTIGATION
- D. Section 02080 – SOIL AND FILL MANAGEMENT
- E. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. A list of all transporters, destination/receiving sites and waste facilities, complete with license numbers and permit numbers (as appropriate), contact person, and address and telephone number that the Contractor utilizes for soil management and waste disposal. In addition, a copy of a memorandum of understanding between the contractor and each facility that will receive excess soil and/or waste material shall be attached to the Waste Management Plan. The memorandum of understanding shall detail the terms under which the facility agrees to accept a specified quantity of soil or waste and detail what if any restrictions may apply.
 - 2. Where appropriate the Contractor shall submit waste manifests and bills of lading for all waste disposed off site to the appropriate authority, agency, facility, or person within the time constraints specified by state and federal regulations. Copies of all waste manifests shall be provided to the Owner within ten (10) days. It is the responsibility of the Contractor to complete all waste manifests and bills of lading completely

and accurately prior to submitting them to the Owner. The Contractor shall be responsible for preparing Licensed Site Professional (LSP) opinion letters to disposal facilities and providing Qualified Environmental Professional signatures on Material Shipping Records and coordinating disposal documentation with all parties. The Owner's LSP and the Owner shall sign any DEP Bill of Lading forms where required only after the Contractor has properly prepared and submitted the DEP forms. The Contractor shall reimburse the Owner for any and all fines associated with inaccurate, incorrect, or improperly completed waste manifests, including fines resulting from late or untimely submittals.

3. Disclose a summary of the history of compliance for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.
4. Prior to transporting any soils or fill material to a disposal facility the Contractor shall submit a letter from the disposal facility indicating that the facility has reviewed the available data and the generator's profile of the material and the facility agrees that it meets the facility's acceptance criteria.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide completed Bills of Lading, Material Shipping Records, manifests, certificates of disposal, weight slips and all other documentation relative to disposal, reuse or recycling of soil and waste material.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall reuse, recycle or dispose of all excess soil and wastes resulting from excavation activities in accordance with federal, state and local regulations and these specifications. Transport shall be by a permitted and licensed waste transporter. The Contractor shall be responsible for supplying the proper manifests to be approved and signed by a representative of the Owner.
- B. Prior to disposal, it shall be the responsibility of the Contractor to maintain segregated waste stockpiles in conformance with all applicable federal, state, and

local waste disposal regulations and as specified in Section 02080 - SOIL AND WASTE MANAGEMENT.

- C. The Contractor shall be responsible for preparing and keeping in proper order all waste manifests and shall designate one person who shall be made available to sign all transportation documentation. The Contractor shall be responsible for obtaining the generator's signature and all other signatures required for the proper completion of the manifests. The Contractor shall allow a minimum of five working days from the date of the submittal for any documents requiring the signature of the Owner and/or the Licensed Site Professional (LSP). The manifests shall document the handling of the waste from the time it is generated until the time it is properly disposed.
- D. The Contractor shall be responsible for obtaining all federal, state, and local permits and variances to allow transport of materials on public roadways.
- E. The Contractor shall be responsible to inform the Owner if hazardous waste disposal will not be performed within sixty (60) days of hazardous waste characterization. This notification shall take place a minimum of thirty (30) days prior to the 60-day deadline. No hazardous waste stockpiled at the site shall remain on site more than 60 days after it is characterized.
- F. The Contractor shall obtain certificates of disposal for all disposed waste.
- G. Transportation of solid wastes shall be in compliance with any relevant federal, state and local special waste requirements, and such as to assure that waste material is not released during transit.

3.2 SOLID WASTES

- A. Transporters of solid wastes that include, but are not limited to, contaminated soil/fill (including oil-contaminated soil/fill), construction and demolition debris, non-hazardous laboratory wastes, bottles, tires, metal parts, asbestos cement, tree stumps, brush, and grass cuttings will utilize truck or dumpsters specifically designed to ensure that material, dust, or liquid is not released in transit. No truck shall be allowed to exit the site until all free liquids are drained from soil/fill being transported off-site. Material shall be covered at all times. The vehicle in which the waste is transported shall be driven directly to the intended destination without any stops or detours in between, except those necessary in response to road conditions, vehicle service needs, or emergencies. Discharge or release of material during transport shall be immediately reported to the Owner. Transporters shall clean up any discharge that occurs in transit, at the Contractor's expense.
- B. The disposal site shall be permitted by the state in which the facility is located to receive and dispose of solid waste, and shall be approved for use by the Owner. The Contractor shall provide copies of the disposal facility's operating permit.

- C. Manifesting of solid waste shall be required and shall include vehicle identification; date of loading and disposal; tonnage, as measured at the disposal site; and signature of the Owner and/or its representative, transporter, and disposal facility's representative. Transportation of the wastes shall be accompanied by the appropriate manifests such as a Massachusetts DEP Bill of Lading, as required in 310 CMR 40.0030, a Waste Material Shipping Record or by a Uniform Hazardous Waste Manifest. The original shall be returned to the Owner, and/or their representative, within ten (10) working days of disposal.
- D. All solid waste shall be disposed in accordance with all applicable federal, state and local laws and regulations, as well as all other state laws through which the waste material is being transported.

3.3 HAZARDOUS WASTES

- A. Transporters of hazardous wastes shall be in conformance with 40 CFR, Part 171, all other federal laws and regulations, Massachusetts 310 CMR 30.400, and all other state laws through whose boundaries the waste material is being transported. The transporter shall provide copies of its EPA identification number, Massachusetts transporter's license, and proof of driver training in transporting hazardous waste.
- B. The disposal site shall be in conformance with 40 CFR, Part 264 and relevant laws of the state in which the facility is located. The Contractor shall provide copies of the disposal facility's EPA and state treatment and disposal permit.
- C. Manifesting of hazardous wastes shall be in conformance with 40 CFR, Part 264, Subpart E and 310 CMR 30.405.

3.4 DUST CONTROL

- A. Dust control measures shall be implemented during loading and transport of waste material from the site in accordance with the contractor's Dust Control Plan, as specified in Section 02080 – SOIL AND WASTE MANAGEMENT.

END OF SECTION 02095

SECTION 02100

SITE PREPARATION

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 includes the following:
 - 1. Provide labor, material, tools and equipment to prepare site as indicated and specified.
 - 2. Protection of existing trees and vegetation outside the limit of work and specifically designated trees and vegetation within the limit of work.
 - 3. Removal trees, stumps and other vegetation.
 - 4. Topsoil stripping.
 - 5. Clearing and grubbing.
- B. Related sections include the following:
 - 1. Section 02210: EARTH EXCAVATION

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXISTING TREES AND VEGETATION

- A. Avoid cutting or injuring trees and vegetation outside easement or property line and outside areas to be cleared as indicated, without Engineer's permission. Protect existing trees from damage.
- B. Contractor shall be responsible for damages outside these lines.

3.2 EXISTING STRUCTURES AND PROPERTY

- A. Remove and reset at completion of project existing signs, posts, catchbasin frames and grates, manhole frames and covers, and granite curbing within construction path unless directed otherwise.
- B. Store at a site designated by Owner, items in reusable condition as determined by Engineer.
- C. For work in loamed areas, strip loam to one side to avoid mixing with excavation materials. Do not take loam from site.

3.3 CLEARING

- A. Cut or remove trees, brush, and other vegetable matter such as snags, bark and refuse, from areas to be cleared as shown on plans within proposed tree line limits and as directed by the Engineer. Clear ground to width of permanent easement unless otherwise directed.
- B. Cut trees, stumps, and stubs to be cleared, except where clearing done by machinery, as close to ground surface as practicable, but no more than 6 in. above ground surface for small trees and 12 in. for larger trees.
- C. Bury elm bark, at least 1 ft. deep, or burn in incinerators off site with anti-pollution controls and fire prevention controls, to prevent spread of Dutch Elm disease as required by applicable laws.

3.4 CLEARING IN WOODED AREAS

- A. Chip and spread wood cleared at locations and cover as directed by the Engineer. Do NOT PERMIT use of elm wood and elm bark as wood chips.

3.5 GRUBBING, STRIPPING, DISPOSAL

- A. Remove stumps and roots larger than 3 in. in diameter to a depth of 12 in., and roots larger than 1/2 in. in diameter to a depth of 6 in. Measure depths to cut from existing ground surface or proposed finished grade, whichever is lower.
- B. Strip stumps, roots, foreign matter, topsoil, loam and unsuitable earth from ground surface. Utilize topsoil and loam insofar as possible for finished surfacing. Do not take loam from site.
- C. Promptly dispose off site material from clearing and grubbing not reused or stockpiled. In doing so, observe all applicable laws, ordinances, rules and regulations. Do not consider work completed until final cleaning, unless otherwise directed.

3.6 STOCKPILES

- A. Stockpiles shall be neatly trimmed and graded to provide drainage from surfaces and to prevent depressions where water may become impounded. All construction operations shall be performed so as not to cause mixing of objectionable materials with the topsoil, and stockpiles shall be protected and shall not be disturbed except for subsequent operations for replacing topsoil. The location of stockpiles shall be approved by the Owner and the Engineer.

3.7 EXCESS TOPSOIL

- A. Topsoil which has been stripped and stockpiled, but is not needed after the completion of all final topsoiling and grassing shall be stockpiled on site in a location to be approved by the Engineer and shall remain the property of the Owner.

3.8 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02100

SECTION 02210

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes excavations of normal depth in earth and rock for trenches and structures; backfilling such excavations to the extent required; filling; dewatering, blasting, rough grading; constructing embankments; miscellaneous earth excavation and rock excavation; 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; and appurtenant work, complete, in accordance with the Drawings and Specifications, and as directed.
- B. All excavated materials not utilized for backfill or fill including all surplus or excess excavated materials, boulders, and pavement materials from the required excavations shall be removed and legally disposed off the project site in disposal areas furnished by the Contractor at no additional expense to the Owner.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS

1.3 SUBMITTALS

- A. General: Shop Drawings, including certificates of Design for dewatering system and support of excavation system, submit the following in accordance with Section 01300 – SUBMITTALS.
- B. Backfill Materials: 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. 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 of the Engineer.
- D. BLASTING WILL NOT BE PERMITTED ON THIS PROJECT
Blasting Design: Not less than 10 calendar days prior to starting a new phase of the work or any time prior to changing the accepted blast design and procedures, submit in writing to the Engineer the following data of the proposed blasting operations.

1. Location, depth, area, anticipated neat lines and relationship to adjacent structures.
2. Diameter, spacing, burden, depth, pattern and inclination of blast holes.
3. Type, strength, amount in terms of weight and cartridges of explosives to be used in each hole, on each delay and the total for the blast.
4. The distribution of the charge in the holes and the priming of each hole.
5. Type, sequence and number of delays, delay pattern; wiring diagram for blast; size and type of hookup lines, and lead lines; type and capacity of firing source; type, size and location of safety switches, lightning gaps.
6. Scaled range or distance used to calculate the scaled range if the blast will exceed vibration limits.
7. Stemming of holes and matting or covering of blast area.

E. BLASTING WILL NOT BE PERMITTED ON THIS PROJECT

Blasting Reports: Complete, maintain and submit to the Engineer permanent blast reports including logs of each blast. Complete reports after each blast to include the following information:

1. Date, time and limits of blast by station.
2. Amount of explosives used by weight and number of cartridges.
3. Total number of delays used and number of holes used for each delay period.
4. On a diagram of the approved blast pattern indicate any holes not drilled, drilled but not loaded, changes in spacing or in pattern of delays or in loading of holes.
5. Total number of holes, maximum charge per hole and corresponding delay number.
6. An evaluation of the blast indicating tights, areas of significant overbreak and any recommended adjustments for the next blast.

F. Filter fabric: Submit the manufacturer's information on the filter fabric to the Engineer for review. See Section 02273 for specifications.

G. Submit the qualifications of the independent geotechnical testing laboratory performing soil testing and inspection services during earthwork operations. The

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.

- H. Backfill Materials: Submit a 20 lb. sample, grain size analysis and curve performed in accordance with ASTM D422 and compaction test results (ASTM D1557 Procedure C) for each proposed source of backfill for review by the Engineer at least one week prior to use of the material. The grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
- I. In addition, a certification statement and analytical results shall accompany each physical sample of material to be imported as crushed stone, bedding sand, gravel sub-base, or structural backfill. At a minimum the certification shall state the point of origin and that the material is free of contaminants. The certification shall include representative sample analysis from each point of origin of backfill to be used on the site. The sample(s) shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082). On-site soils designated as suitable for reuse can be used as backfill without providing the certification required above.
- J. All sampling of soils for chemical testing shall be performed by a person experienced in sample collection and either: 1) a Licensed Site Professional registered in the Commonwealth of Massachusetts; 2) a Professional Engineer registered in the Commonwealth of Massachusetts; 3) a professional Geologist registered in the Commonwealth of Massachusetts; 4) a certified groundwater/environmental professional; or 5) an authorized representative of the one of the persons listed above. Samples of each material shall be submitted to a chemical analytical laboratory, certified by the Massachusetts Department of Environmental Protection.
- K. Submit additional samples every 1000 cubic yards or anytime consistency of material changes in the opinion of the Engineer and submit associated chemical laboratory data on the imported materials throughout the course of the Work, if requested by the Engineer, to evaluate the consistency of the source or process, at no additional cost to the Owner.
- L. Excavation and Excavation Support Plan: For informational purposes only, and if requested by the Engineer, the Contractor shall submit the following prior to the start of the work, in accordance with Section 01300 – SUBMITTALS.
 - 1. Submit within two (2) weeks of Notice to Proceed, the qualifications of the Contractor's excavation support specialist. The excavation support specialist shall have completed at least five (5) successful excavation support projects of equal size and complexity and with equal systems

within the last five (5) years.

2. Submit a detailed temporary excavation support plan stamped and signed by a 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), bracing details, location, layout, depths, extent of different types of support relative to maintaining all existing building foundations adjacent to trench excavations, features, buildings, structures to be constructed, and methods and sequence of installation and removal.
 - b. Certificate of Design: Refer to Section 01300 – SUBMITTALS for form.
 - c. Requirements of dewatering during the construction.
 - d. Minimum lateral distance from the edge of the excavation support system for use of 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. Controlled Density Fill (CDF) Mix Design or Concrete Flowable Fill:
 - a. Prior to beginning the work the Contractor shall submit for review, flowable fill mix designs which shall show the proportions and graduations of all materials for each class and type of flowable fill specified herein.
- M. Dewatering Plan: Contractor shall submit the following prior to the start of the work, in accordance with Section 01300 – SUBMITTALS.
1. Submit within two (2) weeks of Notice to Proceed, the qualifications of the Contractor's dewatering specialist. The dewatering specialist shall 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. Submit a detailed dewatering plan at least (2) weeks prior to start of any dewatering operation. Do not submit design calculations, but submit working drawings for review by the Engineer. 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. The proposed type of dewatering plan and details stamped and signed by a Registered Professional Engineer.
 - b. Certificate of Design: Refer to Section 01300 for form.
 - c. A list and description of equipment including, but not limited to, pumps, prime movers, and standby equipment, as well as the arrangement and location of system components.
 - d. Detailed description of dewatering, maintenance, and system removal procedures.
 - e. Erosion/sedimentation control measures, and methods of disposal of pumped water.
 - f. Types and sizes of sedimentation basins and filters.
 - g. List of all applicable laws, regulations, rules and codes to which dewatering design conforms.
3. Submit a modified dewatering plan within 24 hours, if open pumping from sumps and ditches results in boils, loss of fines or softening of the ground.
4. The Contractor shall be aware that groundwater "underdrains" may exist under all existing sanitary, storm, or combined piping. The contractor shall plan for "underdrains" in their dewatering plan and shall relocate and reconnect "underdrains" as required to complete the work.

1.4 EXCAVATION CLASSIFICATIONS

- A. Earth Excavation or "Excavation" consists of removal of materials encountered to the sub-grade 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 unauthorized excavation, additional excavation, or rock excavation.
- B. Unauthorized Excavation consists of removal of materials beyond indicated

subgrade elevations or horizontal dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at Contractor's expense.

1. Under footings, foundations bases, concrete slabs, retaining walls or other structures, fill unauthorized excavations to the proper elevations with lean concrete. Elsewhere, backfill and compact unauthorized excavations as specified for excavations of the same class, unless otherwise directed by the Engineer.

C. Additional Excavation:

1. When excavation has reached required subgrade elevations or normal depth, notify the Engineer who will review subgrade conditions.
2. If unsuitable bearing materials below normal depth 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.

D. Rock Excavation:

1. Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42-inch wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10 foot 0-inches in width and pits in excess of 30 feet 0-inches in either length or width are classified as open excavation.
2. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling, blasting or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).
3. Determination of rock excavation classification will be made by the Engineer. 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, blasting or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation. 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 preblasted prior to the excavation of overburden soils, the Engineer shall be notified at least two days in advance to allow observation of the preblast 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.

1.5 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. 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. Stockpiles are to be segregated based on geotechnical properties, visual, olfactory, and field screening results. Similar material shall be stockpiled together. Each stockpile must be clearly separable from adjacent stockpiles.

1.6 TEMPORARY EARTH SUPPORT

- A. The Contractor shall design, furnish, place and maintain such temporary excavation support systems (and excavation support systems to remain in place) as required to maintain lateral support 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.
- B. Common types of excavation support systems include, but not limited to singular or multiple stages comprised of cantilevered or internally braced soldier piles and lagging, steel sheet-pile wall, timber sheet-pile wall, trench box, or combinations thereof.
- C. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, temporary stockpiles, construction loads, and other surcharge loads.

- D. In all sheeting, shoring and bracing operations, care shall be taken to prevent injury to persons or damage to structures, roadways, facilities, pipelines, utilities and services. Any injuries to persons shall be the responsibility of the Contractor; and any damage to the work or existing structures occurring as a result of settlement, water or earth pressure, or other causes due to inadequate bracing of other construction operations of the Contractor shall be repaired by the Contractor at no additional cost to the Owner.
- E. 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.
- F. Where sheeting is to be used, it shall be driven ahead of excavation operations to the extent practicable so as to avoid the loss of material from behind the sheeting; where voids occur outside of the sheeting, they shall be filled immediately with selected fill, thoroughly compacted.
- G. 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 3 feet [1.5 m] below the bottom of excavation.
- H. Design temporary excavation support systems to withstand an additional 2 feet [60 cm] of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.
- I. The Contractor shall leave in place all sheeting and bracing at the locations and within the limits ordered by the Engineer in writing. The Contractor shall cut off the sheeting at elevations to be determined by the Engineer. The requirement of excavation support left in place in areas indicated on the Drawings or as directed does not relieve the Contractor from the responsibility of furnishing and installing proper temporary excavation support systems in other areas.
- J. The Contractor shall comply with all federal, state, and local safety regulations and requirements.

1.7 DEWATERING SYSTEM

- A. The Contractor shall design, furnish, install, operate, maintain and remove at his own expense, a temporary dewatering system to ensure that work is performed under dry and stable conditions, free from groundwater and/or surface runoff. The temporary dewatering system shall be implemented so as not to adversely affect construction procedures nor cause excessive disturbance of underlying natural ground. The Contractor shall implement erosion control measures for disposing of discharged water in order to prevent pumped drainage water from causing damage to adjacent property.

- B. Any damage resulting from the failure of the dewatering operations of the Contractor, and any damage resulting from the failure of the Contractor to maintain all the areas of work in a suitable dry condition, shall be repaired by the Contractor, at no additional expense to the Owner. The Contractor's pumping and dewatering shall be carried out in such a manner as to prevent damage to the Contract work and so that no loss of ground will result from these operations. If sub-grade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the sub-grade, and modify system to perform as specified at no additional cost to the Owner. Precautions shall be taken to protect new work from flooding during storms or from other causes. Pumping shall be continuous where directed by the Engineer to protect the work and/or to maintain satisfactory progress.
- 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. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced and protected. Water from the trenches, excavations and drainage operations shall be disposed to avoid public nuisance, injury to public health or the environment, damage to public or private property, or damage to the work completed or in progress. If oil and/or other hazardous materials are encountered after dewatering begins immediately notify the Engineer.
- E. The Contractor shall control the grading in the areas surrounding all excavation so that the surface of the ground shall be properly sloped to prevent water from running into the excavated area. Where required, temporary ditches shall be provided for drainage. Upon completion of the work and when directed, all areas shall be restored by the Contractor in a satisfactory manner and as directed.

1.8 BLASTING

- A. Blasting is not allowed unless it is reviewed and approved by the Engineer. If approved by the Engineer, the Engineer must approve survey reports prior to blasting beginning.
- B. All blasting operations, including transportation, handling, storage and protection of detonators and explosives shall comply with the requirements of the Department of Labor, Occupational Safety and Health Administration provisions, as well as those of State and local regulations. In the case of conflict of regulations, the most stringent regulations shall apply.
- C. Pre-Blast condition Survey: Prior to start of earth/rock excavation or blasting work, the Contractor shall engage an independent professional engineer who shall

conduct a pre-blast condition survey of all existing structures and conditions on the site, adjacent to the site, or in the vicinity of the site. This survey shall extend to such structures, including private wells, or conditions as may be affected by the contractor's construction operations. As a minimum, condition surveys shall be performed on all structures within 200 feet of anticipated blasting areas, and shall include a television inspection of the interior of the existing drainage piping in the construction zone or as designated by the Engineer. The Contractor shall also:

1. Coordinate activities, issue notices, obtain clearances and provide whatever photographic and secretarial assistance is necessary to accomplish the survey.
2. Give notice in writing, to the owner of the property concerned, and tenants of the property. Advise in notice the dates on which surveys are to be made so that they may have representatives present during the examination. Provide copies of all notices to the Engineer.
3. The survey shall consist of a description of the interior and exterior conditions of the various structures examined. Descriptions shall locate any cracks, damage, or other defects existing and shall include such information so as to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks, damage, or other defects exist, or for defects too complicated to describe in words, photographs shall be taken and made part of the record.
4. The survey shall note all public and private wells in the vicinity of the blast area. Condition of wells and flow capacity shall be noted if available.

The Contractor's record of the pre-blast condition survey shall consist of written documentation and photographs of the conditions identified, or a good quality videotape survey with appropriate audio description of conditions and defects. Prior to start of work, one copy of the Contractor's record of condition survey shall be submitted to the Engineer for review and retention.

Upon completion of all earth/rock excavation and blasting work, the Contractor shall make a television survey of the existing drainage systems within the same limits noted previously in order to determine whether there was any damage. In addition, the Contractor shall make an examination similar to the preconstruction survey of any properties, structures, and conditions where complaints of damage have been received or damage claims have been filed and give notice to all interested parties so that they may be present during the final examination. Records of the final examination shall be distributed the same as the original preconstruction survey.

- D. Indemnity: Notwithstanding full compliance with these specifications, approval of blasting plan, and successful limitation to maximum peak particle velocity and airblast overpressure noted below, the contractor shall be solely responsible for any

damage, direct or indirect, arising from blasting and shall hold the Owner and Engineer harmless from any costs of defense, arising from such damage, real or alleged.

E. Qualifications:

1. Persons responsible for blasting shall be licensed blasters in the Commonwealth of Massachusetts and shall have had acceptable experience in similar excavations in rock and controlled blasting techniques.
2. The Contractor shall engage the services of a qualified, independent professional engineer, acceptable to the Engineer to conduct a pre-blast condition survey of adjacent structures.
3. Blast monitoring shall be conducted by an independent, qualified professional engineer or seismologist, trained in the use of a seismograph, and records shall be analyzed and results reported by persons familiar with analyzing and reporting the frequency content of a seismograph record.

F. Codes, Permits and Regulations:

1. The Contractor shall comply with all applicable laws, rules, ordinances and regulations of the Federal Government, the Commonwealth of Massachusetts, and the City of Salem, governing the transportation, storage, handling and use of explosives. All labor, materials, equipment and services necessary to make the blasting operations comply with such requirements shall be provided without additional cost to the Owner.
2. The Contractor shall obtain and pay for all permits and licenses required to complete the work of this section.
3. In case of conflict between regulations or between regulation and Specifications, the Contractor shall comply with the strictest applicable codes, regulations or Specifications.

G. Blasting Limit Criteria:

1. Peak Particle Velocity Limits
 - a. The Contractor shall conduct all blasting activity in such a manner that the maximum peak particle velocity at all structures in the vicinity does not exceed the following:

<u>Distance from Blast to Structure</u>	<u>Maximum P.P.V.</u>
---	-----------------------

< 150 ft.	1.5 in./sec.
150-300 ft.	1.00 in./sec.

> 300 ft.

0.75 in./sec.

2. Airblast Overpressure Limit

- a. The Contractor shall conduct all blasting activity in such a manner that the peak airblast overpressure at tall above-ground, occupied structures in the vicinity of blasting does not exceed 0.014 psi.

H. Blast Vibration Monitoring

1. The Contractor shall monitor peak particle velocities and airblast overpressures resulting from each blast at a location adjacent to the nearest structure from the blast.
2. All instrumentation proposed for use on the project shall have been calibrated within the previous six (6) months to a standard which is traceable to the National Bureau of Standards. Characteristics of required instrumentation are listed below:
 - a. Measure the three (3) mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.
 - b. Measure and display the maximum peak particle velocity component and airblast overpressure, and the frequencies of each. The readings must be displayed and be able to be read in the field, immediately after each blast.
 - c. Furnish a permanent time history record of particle velocity waveforms and airblast overpressure waveforms.

I. Safety Precautions

1. Clearing the Danger Area Before Blasting: No blasting shall be permitted until all personnel in the danger area have been removed to a place of safety. A loud, audible, warning system, devised and implemented by the Contractor, shall be sounded before each blast. The Contractor shall familiarize all personnel on the project, Owner, Police Officers, and Engineer with the implemented system. The danger area shall be patrolled before each blast to make certain that it has been completely cleared, and guards shall be stationed to prevent entry until the area has been cleared by the blaster following the blast.
2. Explosives shall be stored, handled and employed in accordance with federal, state and local regulations.
3. No explosives, caps, detonators or fuses shall be stored on the site during non-working hours.

4. Blasting mats shall be used to cover the top and vertical face of all blasts in order to minimize the possibility of excessive throw of rock. Any damaged mats shall be replaced with mats in good condition before blasting continues. The Engineer shall approve the condition of all mats.
5. The Contractor shall be responsible for determining any other safety requirements unique to blasting operations at these particular sites so as not to endanger life, property, utility services, any existing or new construction, or any property adjacent to the site.
6. No requirement of, or omission to require, any precautions under this Contract shall be deemed to limit or impair any responsibility or obligations assumed by the Contractor under or in connection with this contract; and the contractor shall at all times maintain adequate protection to safeguard the public and all persons engaged in the work, and shall take such precautions as will accomplish such end, without undue interference to the public. The Contractor shall be responsible for and pay for any damage to adjacent roadways or structures resulting from work executed under this Section.

J. General Blasting Procedures

1. The time during which explosives may be used is restricted to Monday through Friday between the hours of 8:00 AM and 4:00 PM (prevailing time). The use of explosives is not permitted on weekends (Saturday and Sunday), holidays, on the eve of a holiday nor between the hours of 4:00 PM and 8:00 AM, unless approved in writing by the Engineer. The Contractor shall schedule blasting in order to minimize traffic disruptions.
2. Immediately after blasting, the Contractor shall have sufficient equipment available at the site to clear the pavement of blastrock. The Contractor shall also use, as required, a mechanical sweeper to control dust and small stones.
3. The Contractor shall advise the Engineer at least two working days in advance of the dates on which he proposes to perform blasting operations, giving the approximate hour, for the Engineer's approval. The Contractor will be responsible for obtaining the necessary permits and police officials required to close local streets during periods of blasting. The Contractor will notify the Engineer by noon of the day prior to any day he plans not to blast where the weekly schedule shows a day of blasting. This does not include changes due to weather or unexpected equipment breakdowns.
4. The maximum time for which traffic may be stopped at any single time shall be fifteen minutes, from the time traffic is stopped by police until all travel lanes are cleared of blast debris, to the satisfaction of the Engineer, and notice is given to the police that traffic may be resumed in both

directions. The Contractor shall reduce the size of the blast, change the design and method of the blast, use more mats, or otherwise alter the blasting so that the traffic is not stopped for more than fifteen minutes.

5. Blast hole diameter shall be no greater than 3 inches.
6. No free flowing, pourable or pumpable explosives shall be used. All explosives shall be used. All explosives shall be in cartridges or other semi-rigid container.

PART 2 – PRODUCTS

2.1 DEWATERING MATERIALS

- A. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least on (1) pump for every five (5) used.
- B. Provide and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.
- C. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.

2.2 TEMPORARY EXCAVATION SUPPORT 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 type.
- 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.
- G. Cast-in-Place Concrete: 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.

2.3 TRENCH DAMS

- A. Trench Dam shall be self supporting and provide a watertight seal around the pipe by use of appropriately sized elastomeric PVC flexible coupling. Barriers shall form an impenetrable barrier in the pipe envelope to the flow of water. Baffles constructed of ABS plastic are acceptable. Trench Dams shall be Ripley's Dams of Durham, NH or equal.

2.4 BACKFILL MATERIALS

- A. Clean Fill - Analytical Results. The Contractor shall provide certification that imported fill and/or topsoil material to be used as fill, borrow or subbase is free of contaminants. Certification must indicate the point of origin and include laboratory analytical results as specified and include a statement that the material is free of organic, or any other unsuitable contaminants and that metal concentrations are consistent with background levels. No processed concrete, recycled asphalt, brick, coal ash or wood ash shall be present in any fill material. Evidence of such recycled products in the fill shall be rejected and returned to the supplier at no additional cost to the owner.
- B. Common Fill: Common fill shall be soil containing no stone greater than 2/3 loose lift thickness. The materials shall be free of trash, ice, snow, tree stumps, roots and other organic and deleterious materials. Common fill shall not contain more than 25 percent by weight of silt and clay. It shall be of such a nature and character that it can be compacted to the specified densities in a reasonable length of time. Topsoil and subsoil shall not be considered common fill.

Common fill shall be used as trench backfill above the crushed stone layer and below the gravel subbase material, and outside limits of structures.

- B. Structural Fill: Structural fill shall consist of gravel and sand consisting of hard durable particles, and free from trash, ice and snow, tree stumps, roots and other organic and deleterious or organic matter. Structural fill shall be used as replacement backfill for unsuitable soils below pipes and structures. Structural fill shall conform to the following gradation requirements

Sieve Size	Percent Finer by Weight
6-inch	100 (1)
3-inch	70-100
1-inch	45-90
No. 4	20-70
No. 10	15-60
No. 40	10-40
No. 200	0-10
(1) Four-inch maximum particle size within 12 inches of slab.	

Sieve Size	Percent Finer by Weight
footing or pavement grade.	

- D. Crushed Stone: Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Sieve Size	Percent Passing by Weight	
	1-1/2-inch Stone	¾-inch Stone
2-inch	100	
1-1/2-inch	95-100	
1-inch	35-70	100
¾-inch	0-25	90-100
½-inch		10-50
3/8-inch		0-10
No. 4		0-8

Crushed stone (1-1/2-inch) shall be used as the working mat below precast structures, and ¾-inch shall be used for bedding around PVC pipes.

- E. Gravel Subbase: The top layer of backfill in unpaved sections of roads and where directed by the Engineer shall consist of compacted 12-inch thickness of gravel subbase meeting MHD specification section M1.03.1 as indicated below:

Sieve Size	Percent Passing by Weight
3-inch	100
1-1/2-inch	70-100
¾-inch	50-85
No. 4	30-60
No. 200	0-10

- F. Control Density Fill (CDF) / Flowable Fill: Controlled density fill shall consist of a cementitious hard excavatable mixture of aggregate, Portland Cement, Fly Ash and air entrained admixtures. The material shall be of the type specified in the Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, Type 2E. Controlled density fill shall be used as trench backfill material at locations where compaction equipment is inaccessible as directed by the Engineer.

PART 3 - EXECUTION

3.1 DEWATERING

- A. Execution of any earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed and the geotechnical instrumentation has been installed.
- B. Furnished, install, operate, and maintain dewatering, re-infiltration, treatment and discharge systems as indicated or specified and in accordance with the dewatering plan. As no dewatering flows shall be discharged to surface waters either directly or indirectly without appropriate settling, at a minimum, the Contractor shall provide a settling tank with a capacity of 10,000 gallons, so that if pumping rates exceed discharge rates, sufficient storage capacity is available. Delays due to insufficient storage capacity will be at no additional cost to the Owner. The Contractor is responsible to evaluate available data and determine the necessary storage capacity so as not to impede construction activities.
- C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.
- D. Dewatering shall lower the groundwater to at least 12-inches below the bottom of excavation.
- E. Do not excavate until the dewatering system is operational.
- F. Discontinue open pumping from sumps and ditches, if such pumping is resulting in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit to the Engineer at no additional cost to the Owner.
- G. Where sub-grade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials at no additional cost to the Owner.
- H. Dewatering Discharges:
 - 1. Water to be infiltrated need not be treated. Contractor shall provide infiltration that complies with relevant local, state and federal regulations.
 - 2. Transport pumped or drained water to discharge locations in compliance with applicable permits and without interference to other work; damage to or contamination of pavement, other surfaces, or property; erosion; or siltation.
 - 3. Provide separately controlled pumping lines.
 - 4. Immediately notify the Engineer if groundwater is encountered that is suspected to be contaminated with substances other than those for which

the treatment system has been designed. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.

I. Compliance with Dewatering and Related Permits and Regulations

1. Discharging groundwater and allowing for natural infiltration may not be a viable option for controlling groundwater in the project area. Should dewatering activities be required where the Contractor needs to discharge groundwater to a location other than the point of origin, then the Contractor shall be prepared to store, treat and discharge the water in accordance with applicable permits and regulations. Periodic sampling, as may be required to demonstrate treatment effectiveness and compliance with pretreatment standards specified in any local, state or federal discharge permit required shall be the responsibility of the Contractor and its Dewatering Professional. Water that can not be infiltrated is anticipated to be discharged to the local sewer system under a temporary construction dewatering permit to be obtained by the Owner. If neither infiltration nor discharge to the local system is feasible, the Contractor shall be responsible for seeking coverage under the appropriate EPA/NPDES permit. At a minimum, the Contractor shall be prepared to comply with standard local permit conditions including periodic testing of the effluent for Total Toxic Organics (TTO) (VOA), TTO (ABN Extractables), petroleum hydrocarbons (MADEP EPH), pH, total metals, and total suspended solids (TSS); and with standard NPDES permit conditions including periodic testing of the treatment system influent, mid-fluent and effluent for benzene, toluene, ethylbenzene, xylenes, TPH, metals, and TSS. The dewatering Plan shall include a description of procedures and information related to the collection of readings, maintenance of logs and other required documents. At a minimum, provisions of the local Construction Dewatering Permit, EPA NPDES Storm water General Permit for Construction Activities, EPA/DEP NPDES Permit and Plan approval for Construction Site Dewatering and the local Construction Commission Order of Conditions.
2. The Contractor, through its Dewatering System Professional:
 - a. Shall furnish all labor, equipment and materials necessary to obtain accurate representative samples of the groundwater and for analysis for the set of analytical parameters specified above and as required by local, state and federal permits and regulations.
 - b. Shall coordinate sampling activities with the Engineer. The Engineer reserves the right to sample treated and untreated dewatering flows at any time.
 - c. Shall take readings from the treatment system in accordance with the dewatering plan.

- d. Shall collect and initial sample of untreated and treated groundwater at the beginning of dewatering activities within the construction area.
 - e. Shall prepare and keep in proper order all records required by regulatory authorities and permits.
 - f. Shall maintain logs and other records in accordance with the Specifications, regulatory agency and permit requirements, and the Dewatering Plan.
 - g. Shall coordinate analysis of samples by an appropriately certified analytical laboratory in accordance with the Specifications, regulatory agency and permit requirements, and the Dewatering Plan, and ensure that laboratory detection limits meet permit requirements.
 - h. Shall comply with reporting requirements in a timely manner and in the format required by the relevant permit. Reporting in compliance with permit requirements includes, but is not limited to, notification to the appropriate regulators and the Engineer prior to discharge; submittal of laboratory analytical reports for each sampling event; submittal or reports for each reporting period during which no discharge occurs; notification of non-compliant discharges; notification of termination of discharge; and response to permit-related questions posed by regulators or the Owner and Engineer.
 - i. If water will be discharged under National Pollutant Discharge Elimination System (NPDES) permit, submit notifications and reports to both the Environmental Protection Agency (EPA) and the appropriate regional office of the Massachusetts Department of Environmental Protection (DEP). Comply with pre-discharge notification, discharge reporting, notification of no discharge, and termination of discharge notification requirements; and respond to inquires or correspondence from EPA or DEP regarding permit issues
 - j. If water will be discharged under local permit, submit notifications and reports as required in the permit.
 - k. For monthly or less frequent reporting deadlines, provide the Engineer with copies of all reports fourteen (14) days prior to the reporting deadline, and submit reports to the appropriate agency(ies) at the same time. Provide copies of other dewatering documents to the Engineer immediately.
3. Install and maintain erosion/sedimentation control devices at the point of discharge as indicated or specified and in accordance with the dewatering plan.

4. The Contractor shall obtain all federal, state, country, and all local permits and variances to allow transport of materials on public roadway, should such transport be necessary.
 5. The Contractor shall dispose of all wastes resulting from construction dewatering activities in accordance with local, federal and state regulations.
 6. The Contractor is solely responsible for the implementation of the permit requirements, and is solely responsible for any punitive action resulting from any violation of the permit. The actual permit issued shall become part of this Contract by either addendum or by change of order. If the actual permit is included by change of order, no additional costs for implementing the permit will be considered by the Owner, when the actual permit is issued.
4. Removal
1. Do not remove dewatering system without written approval from the Engineer.
 2. Backfill and compact sumps or ditches with crushed stone wrapped with geotextile fabric.
 3. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.

3.2 EXCAVATION SUPPORT SYSTEM

- 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. Do not drive sheeting within 100 feet [30 m] of concrete less than seven (7) days old.
- D. 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.
- E. Bottom of the trench box excavation support system shall be above the pipe invert prior to installing the pipe.
- F. Notify utility owners if existing utilities interfere with the temporary excavation

support system. Modify the existing utility with the utility owners permission or have the utility owner make the modifications at no additional cost to the Owner.

- G. Sheeting shall be left in place unless otherwise indicated or approved in writing by the Engineer.
- H. 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, clean screened gravel or select borrow by tamping with tools specifically adapted for that purpose.
- I. The excavation support system left-in-place shall be cut-off a minimum of 2 feet [60 cm] below the bottom of the next higher foundation level or a minimum of 5 feet [152 cm] below finished grade or as specified.
- J. Conduct survey of the locations and final cut-off elevations of the excavation support systems left in place.
- K. Submit as-built information, prior to backfilling.

3.3 FILLING AND BACKFILLING

- A. Subgrade Preparation: After the subgrade has been shaped to line, grade, and cross-section, it shall be thoroughly compacted. This operation shall include any required reshaping and wetting to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with structural fill material from excavation or borrow. The resulting area, and all other low sections, holes, or depressions shall be brought to the required grade with structural fill material and the entire subgrade shaped to line, grade and cross-section and thoroughly compacted.
- B. Backfill Material Selection: Unless otherwise specified or directed, material used for filling and backfilling shall meet the requirements specified under Products (Part 2). In general, the material used for backfilling utility trench excavations shall be material removed from the excavations provided that the reuse of these materials result in the required trench compaction and meets the requirements specified for common fill. All backfill placed within the structure limits shall be structural fill unless otherwise specified. In areas where the bottom of the excavation is in fine sand and silt, and is below the groundwater table, the first lift of backfill shall be 12-inches of compacted 3/4-inch crushed stone to provide a working mat and drainage layer.

Place backfill to a maximum loose lift thickness of 12 inches. Maintain backfill material with an uniform moisture content, with no visible wet or dry streaking, between plus 2 percent and minus 3 percent of optimum moisture content. The final filled soil mass shall be as uniform as possible in lift thickness, moisture content, and effort required to compact soil mass.

C. Trench Backfill:

1. The trenches shall be backfilled as soon as practicable with common fill material. All trench backfilling shall be done with special care, in the following manner and as directed by the Engineer.
2. Backfill material for pipe bedding as shown on the drawings shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench to the depths shown on the drawings. The backfill material shall be placed by hand shovels, in layers not more than 4-inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids.
3. The balance of backfill shall be spread in layers not exceeding 12-inches in loose depth. Each layer shall be thoroughly compacted by mechanical methods and shall contain no rock, stones or boulders larger than 4-inches in their greatest dimension.
4. All trench backfilling shall be done with special care and must be carefully placed so as not to disturb the work at any time; if necessary, a timber grillage or other suitable method shall be used to break the fall of material. The moisture content of the backfill material shall be such that proper compaction will be obtained. Puddling of backfill with water will not be permitted. Backfill within areas to receive topsoil or pavement construction shall be made to grades required to establish the proper subgrade for the placement of topsoil or pavement base courses.
5. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density at least 95 percent of its maximum density, 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.
6. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.
7. During filling and backfilling operations, pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the observation of the pipelines shows poor alignment, displaced pipe or any other defects they shall be remedied in a manner satisfactory to the Engineer at no additional cost to the Owner.
8. The top 12-inches of backfill in paved roads shall be constructed with 12-

inches of gravel subbase material. The material shall be placed in two 6-inch lifts; each lift proof rolled and compacted with rollers before placing subsequent lifts.

9. In no case shall frozen materials be used for trench backfill.

D. Backfilling against Structures:

1. Backfilling against masonry or concrete shall not be done until permitted by the Engineer. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed, special leakage tests of the structures shall be made by the Contractor, as required by the Engineer. After the satisfactory completion of leakage tests and the satisfactory completion of any other required work in connection with the structures, the backfilling around the structures shall proceed using suitable and approved excavation material. The best of the backfill material shall be used for backfilling within 2 feet of the structure. Just prior to placing backfill, the areas shall be cleaned of all excess construction material and debris and the bottom of excavations shall be in a thoroughly compacted condition.
2. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures. During backfilling operations, care shall be exercised that the equipment used will not overload the structures in passing over and compacting these fills. Except as otherwise specified or directed, backfill shall be placed in layers not more than 12-inches in loose depth and each layer of backfill shall be compacted thoroughly and evenly using approved types of mechanical equipment. Each pass of the equipment shall cover the entire area of each layer of backfill.
3. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be made good by the Contractor at no additional expense to the Owner.

- E. After backfilling trenches and excavations, the Contractor shall maintain the surfaces of backfill areas in good condition so as to present a smooth surface at all times level with adjacent surfaces. Any subsequent settling over backfilled areas shall be repaired by the Contractor immediately, in a manner satisfactory to the Engineer, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to the Owner.

- F. The finished subgrade of the fills and filled excavations upon which topsoil is to be

placed, or pavements are to be constructed, shall not be disturbed by traffic of other operations and shall be maintained in a satisfactory condition until the finished courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.

- G. Uniformly smooth grading of all areas to be graded, as indicated and as directed, including excavated and filled sections, embankments and adjacent transition areas, and all areas disturbed as a result of the Contractor's operations, shall be accomplished. The finished surfaces shall be reasonably smooth, compacted and free from surface irregularities.

3.4 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:

Area	ASTM Density Degree of Compaction
Below footings	95%
Below slabs	95%
Pavement base course	95%
Pavement subbase	95%
General fill below pavement subbase	92%
Trench backfill - below pavements	92%
- below landscaped areas	90%
- below structures	95%
Other areas	90%

- B. **Moisture Control:**

1. Fill that is too wet for proper compaction shall be disc'd, harrowed, or otherwise 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. **Unfavorable Conditions:**

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.

D. Compaction Control:

1. All methods used to determine and verify the proper compaction of backfill shall be in accordance with AASHTO standards specifications for density of soil and soil-aggregate in-place by nuclear methods (shallow depth) (designation T238-86 method B-direct transmission shall be used to determine in-place density) and moisture content of soil and soil aggregate in place by nuclear methods (shallow depth) (designation T239-91). 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 shall be made at the Contractor's expense by the geotechnical testing laboratory.
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.
3. In-place density tests shall be performed as a minimum according to the following or as directed by the Engineer:
 - a. Two tests per list under spread footings and slabs.
 - b. A minimum of every 5 cubic yards of backfill in trenches or around structures.

3.5 FINE GRADING

- A. Before surface or subbase is spread, the subgrade shall be shaped to a true surface conforming to the Drawings. All depressions and high spots shall be filled with common fill 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. Subbase Spread and Application:
 1. The contractor shall employ at his own expense a Registered Land Surveyor to establish, maintain and ensure that the grades and thicknesses for road reconstruction are completed to the specified tolerances and design.

2. The contractor shall establish and/or maintain the subbase grade within 0.25 inches plus or minus of the existing or design grades as indicated directly on plans or as indicated for top of paving surfaces less required thickness, or as directed by the Engineer.

END OF SECTION 02210

SECTION 02252

PRECAST CONCRETE MANHOLES

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes all labor, equipment, appliances, and materials required for construction of precast concrete sanitary sewer manholes and storm drain manholes, complete and in place, in accordance with the Drawings and Specifications and as directed.
- B. All manholes shall have precast concrete base sections unless a cast-in-place concrete base with precast concrete risers or special structure is specifically indicated on the Drawings. Brick for extending frames to grade is specified in Section 02590.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING
- C. Section 02590 – BRICK MASONRY
- D. Section 03300 – CAST-IN-PLACE CONCRETE
- E. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Section 01300 – SUBMITTALS.
 - 1. Complete shop drawings for all precast manhole sections, cast iron frames and covers and appurtenances. Cast iron frames and covers shall be from a United States manufacturer.
 - 2. Prior to fabrication, submit shop drawings showing details of precast monolithic base sections, risers, eccentric cone manhole tops and flat slab manhole tops, joints and gaskets, construction details, tolerances, and other information as required by the Engineer.
 - 3. Submit manufacturer's recommended installation procedures for informational purposes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Precast Bases and Risers: Except as otherwise indicated, precast reinforced concrete manhole bases and risers shall be 48 inches, 60 inches, 72 inches, or 96 inches, and with top sections of types indicated or as directed; manhole sections shall conform to the requirements of ASTM C478, latest revision, except as modified herein and/or on the drawings. Each manhole section shall be constructed with a bell-and-spigot or tongue-in-groove joint. The manhole sections shall be manufactured by the centrifugal, roller suspension or vertical cast process; workmanship and methods shall be in accordance with the best practices of modern shops for this type of work. The height and diameter of manhole bases shall be as required to accommodate size of pipe used, as approved. The manhole risers shall be available in 2, 3, and 4-foot lengths; manhole tops of the eccentric cone type shall be 3 or 4 foot lengths, with 24-inch inside diameter opening at top, unless otherwise noted, as shown in the details; manholes larger than 4 feet in diameter at the base shall be reduced in diameter to 4 feet at the top riser section unless noted otherwise on the plans; manhole tops of the flat slab type, where space restrictions exist or where directed, shall be not less than 8 inches thick and reinforced as indicated, and shall have an opening having an inside diameter as specified above. Polypropylene coated ½-inch grade 60 steel rod manhole steps shall be provided in each manhole base, riser and cone type top and shall be integrally cast in the bases, risers and tops. Furnish test results demonstrating step capability to resist pullout force of 2200 pounds. Manhole steps shall be arranged in the manhole sections so as to provide steps approximately 12-inches on center for full height of installation of each manhole. Manhole bases and risers shall have the wall thicknesses as stated in the Drawings; cone type units shall taper to a minimum wall thickness of 8-inches at top.
- B. All exterior concrete surfaces shall be coated with Coal Tar Epoxy Coating with minimum solids content by volume of 73 percent, maximum V.O.C. of 1.83, a dry film thickness per coat between 8.0 and 10.0 mils, and a two coat minimum.
- C. Frames and covers shall be heavy-duty Type A Massachusetts Standard and conform to the "Construction Standards" and "Standard Specifications for Highways and Bridges", of the Commonwealth of Massachusetts. All frames shall have a minimum clear opening of 24 inches. Submit drawings to Engineer for approval before fabrication. Iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects affecting the strength and value for the service intended. Frames and covers to have factory applied coating to prevent corrosion. The finished coating shall be tough and tenacious when cold and not brittle or with any tendency to scale off under seasonable temperature changes.
1. Frames and covers shall be manufactured by a United States manufacturer who can demonstrate at least five years of successful experience.
 2. Frames and covers to be as manufactured by E.L. LeBaron Foundry Co., Neenah Foundry Company, Campbell Foundry Company or equal.
- D. Cast-in-place concrete manhole bases, special structures and invert tables shall be constructed as indicated and in accordance with the materials and construction methods

and provisions of Section 03300 and Section 02590. Manhole base slabs shall have a minimum thickness of 6 inches for risers up to and including 48 inches in diameter and 8 inches minimum thickness for diameters larger than 48 inches.

- E. Jointing: Ends of each length of manhole riser, the bottom end of manhole tops of the cone type, base slabs, and the tops of monolithic bases shall be provided with bell-and-spigot or tongue-and-groove ends of concrete formed on machined rings to insure accurate joint surfaces. Jointing shall be O-ring gaskets or butyl rubber molded sealants. All joints shall be provided so as to be watertight under all conditions of service. The ends of base, riser, and cone sections to be jointed using neoprene "O-ring" type joints shall be designed to enclose the gasket on four surfaces when the joint is in its final position.
- F. Gaskets for sealing joints using the "O-ring" type gaskets shall conform to ASTM C443, latest revision, and shall be of rubber of a special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of neoprene gaskets for pipe joints, or shall be vulcanized butyl rubber sealants meeting or exceeding Federal Specifications SS-S-210, latest issue.
1. Each gasket shall be a continuous ring of round solid cross-section having smooth surfaces free from blisters, porosity and other imperfections. The joint sealing gasket shall be of a composition and texture which shall be resistant to sewage, industrial wastes including gasoline, oils and groundwater, and which will endure permanently under the conditions likely to be imposed by this use. The tensile strength shall be at least 1,200 psi. The elongation shall be such that 2-inch gauge marks shall stretch to not less than 9 inches. The compression set (constant deflection) shall not exceed 25 percent of the original gauge length. The tensile strength after accelerated aging shall be not less than 80 percent of the original strength.
 2. The butyl rubber sealant shall have a self adhesive nature and shall have a diameter of 1 inch and shall be furnished in coils. The sealant shall meet the following properties:

DESCRIPTION	SEALANT PROPERTY
Base	Vulcanized Butyl Rubber
Percent of solids	100%
Shore "A" Durameter:	
Initial	10
Aged	20
Adhesion to clean surfaces	Excellent
Temperature Range:	
Application	-20 degrees F to 120 degrees F
Service	-65 degrees F to 200 degrees F
Water Absorption after	Less than 5%
14 days immersion:	
Chemical Resistance after 7 days immersion in	Excellent
5% Potassium Hydroxide and 5% Hydrochloride Acid	
Resistance to Water and	Excellent

DESCRIPTION	SEALANT PROPERTY
Organic Solvents	
Resistance to Shock, Heat, and Cold	Excellent
Color	Black
Shelf Life	Excellent
Elongation	
Initial	30%
2 weeks at 190 deg F, drying	250%
2 weeks in water	300%
Weather Resistance	Excellent
Moisture Diffusion Resistance	Excellent
Specific Gravity	1:18
Flash Point	None
Fire Point	Over 620 degrees F

- G. Concrete: The concrete for precast manhole sections shall have an average strength of not less than 4,000 psi at 28 days. Strength shall be determined by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the manhole sections, cores cut from the manhole sections, or by other approved methods. Not less than two concrete strength tests shall be made for each 100 linear feet of manhole sections and the test results submitted to the Engineer. Testing may be conducted at the manufacturer's plant or at an approved testing laboratory and shall be the responsibility of the Contractor, at no additional expense to the Owner.
1. Cement shall be moderate heat-of-hydration Portland cement conforming to ASTM C150, latest revision, Type II.
 2. Absorption, determined by absorption test described in ASTM C478, latest revision, shall not exceed 8 percent of dry weight.
- H. Mortar (grout), for sealing mortar-type joints or grouting field made pipe openings, shall be a non-shrink type mortar or grout which shall be a factory-mixed ready-to-use product containing especially prepared aggregate, cement and sand and other components which will produce a mortar or grout with properties to counteract shrinkage, increase density, withstand impact, improve workability, produce watertight joints, and which will be suitable for jointing around pipes entering manholes.
- I. Manhole steps shall be comprised of ½-inch grade 60 steel reinforcement rod encased in polypropylene copolymer plastic.
1. Steps shall have a tread width of 14 inches.
 2. Furnish test results demonstrating step capability to resist pull out force of 2200 pounds.

PART 3 – EXECUTION

- 3.1 Inspection: Acceptance of precast reinforced concrete manhole sections will be made on the basis of plant tests, material tests, and inspection of the completed product, in accordance with the

requirements of ASTM C478, latest revision, with the following modifications.

- A. Manhole sections shall not be shipped for at least five days after manufacture when cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 150 degrees F for a period of not less than 8 hours, or when necessary, for such additional time as may be required to enable the manhole sections to meet specification requirements.
- B. All manhole sections will be inspected upon delivery; manhole sections which do not conform to specification requirements will be rejected and shall be removed immediately from the site by the Contractor. Furnish all labor and facilities necessary to assist the Engineer in inspecting the material.
- C. All manhole sections which have been damaged after delivery, and manhole sections installed in the work which are found to be damaged will be rejected and shall be removed and replaced by the Contractor with new, sound and approved material, at no additional expense to the Owner. At the time of inspection, the surfaces of the sections shall be dense and close-textured. Cores shall serve as a basis for rejection of manhole sections if poor bond or reinforcement is exposed.
- D. The quality of all materials, processes of manufacture, and the finished manhole sections shall be subject to inspection and approval of the Engineer. Such inspection may be made at the place of manufacture and/or on the site, and the manhole sections shall be subject to rejection at any time because of failure to meet any of the specification requirements, even though sample manhole sections may have been accepted as satisfactory.

3.2 HANDLING

- A. Each manhole section shall be handled into its position in the trench only in such manner and by such means as recommended by the manufacturer of the manhole sections, and as approved. Provide all necessary slings, straps and other devices for the safe and satisfactory handling and support of the manhole sections during lifting, installation and final positioning of the sections. Lifting holes may be permitted provided suitable rubber or concrete stopper or other approved devices are provided for plugging and sealing the holes and watertight, all as approved.

3.3 INSTALLATION OF PRECAST CONCRETE MANHOLES

- A. Manhole sections shall be installed using approved type neoprene "O-Ring" type gasket or butyl rubber sealants for sealing joints of manhole sections; jointing shall be performed in accordance with the pipe manufacturer's recommendations, and as approved. Manhole sections shall be installed level and plumb. Manholes shall be constructed on a 12-inch compacted crushed stone or gravel base as indicated. Water shall not be permitted to rise over newly made joints until after inspection as to their acceptability. All jointing shall be done in a manner to insure watertight joints. The cast-iron manhole frames shall be set on the manhole top in full bed of mortar to the finished grade and the outside of frame shall be completely encased in cement-mortar, as specified and as indicated. Opening in precast manhole sections to extent indicated on the drawings to receive entering pipes shall be made at the place of the manufacturer; where opening cannot be determined they shall be cut in the field. Depending upon the type of pipe seals to be furnished, pipe openings shall be provided with manhole seals of proper sizes to accommodate pipe sizes

and shall be cast into the manhole at the time of manufacture and the following type seals or similar product shall be provided (Interpace "New Lok Joint Flexible Sleeve", A. LOK Premium Compression Coupling "A-Lok Field Sleeve", or "Press Wedge II" by Pre-Seal Basket Corporation). Field applied seals shall be "K or N Seal" boot or equal. Manhole sleeves, gaskets and sealants shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc., and pipe installation shall conform to manufacturer's recommendations. When openings are made in the field, the openings for entering pipes shall be of a size to provide a uniform annular space between the outside of pipe wall and the opening in the manhole section of 3/4 inch, and after the pipe is in position the annular space shall be solidly filled with non shrink mortar. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Openings which are cut in the manhole sections in the field shall be carefully made so as not to damage the sections; damaged sections will be rejected and shall be replaced at no additional expense to the Owner. Manhole sections shall be installed so that the manhole steps shall be in alignment. Brick masonry shall be provided for adjusting manhole frames and covers to grade. Exterior surfaces of brick masonry shall be plastered with 1/2 inch of cement mortar. Brick masonry and mortar shall be the same as that specified in Section 02590 – Brick Masonry. Manhole inverts shall be brick masonry or concrete and shall have a cross-section shaped to conform to connecting pipes; changes in size shall be made gradually and evenly. Concrete and brick masonry for manhole inverts shall conform to Section 03300 - Concrete or Section 02590 – Brick Masonry, as applicable, constructed as indicated and as specified.

- B. Where shown, existing manholes shall be abandoned and filled. The brick and/or concrete masonry shall be removed 3 feet below the finished street or ground surface, and the base broken so that water cannot collect in the abandoned structure. Pipes extending from the structures shall be plugged with brick masonry or concrete, and manholes shall be backfilled with suitable granular material, compacted in accordance with Section 02210 – Earth Excavation, Backfill, Fill, and Grading, to the densities required, except that compaction in 6-inch lifts may be ordered by the Engineer if it deems additional compaction is necessary.

3.4 TAP CONNECTIONS

- A. Make connections to existing underground drainage structures in accordance with the detail in the Contract Drawings.
- B. Take care while making tap connections to prevent concrete or debris from entering existing piping or structure. Remove debris, concrete, or other extraneous material that may accumulate.

3.5 BACKFILLING

- A. General: Conduct backfill operations of open cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed, all in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

3.6 LEAKAGE TESTS

- A. As approved by the Engineer, the Contractor may perform the leakage tests using an approved low air pressure testing system. This type of test may be used only immediately after assembly of the manhole and only prior to backfilling. The manhole to pipe connection should only be a flexible connector. All lift holes shall be plugged with a non-shrinking mortar. For this test, each manhole shall be tested under 10-inch Hg vacuum. The test shall pass if the vacuum remains at 10-inch Hg or drops no lower than 9-inch Hg after 60 seconds for 4 or 5 foot manholes from 0 to 10 feet deep, 75 seconds for 4 or 5 foot manholes from 10 to 15 feet deep, or 90 seconds for 4 or 5 foot manholes from 15 to 25 feet deep. A volume equivalent shall be calculated for larger diameter manholes to determine the testing length based on these parameters.

END OF SECTION 02252

SECTION 02271

RIPRAP

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 includes the following:
 - 1. Providing labor, materials, and equipment required to place stone riprap or slopes for embankment slopes protection, drainage outfalls, including backing layers as indicated and specified.
- B. Related section includes the following:
 - 1. Section 02210 - Excavation, Backfill, Fill and Grading

1.3 SUBMITTAL

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Material specifications and conformance to standards specified.

PART 2 - PRODUCTS

2.1 STONE

- A. Specific gravity 2.5 min., absorption 2 percent max. in accordance with ASTM C127.
- B. Soundness 5 percent max. loss in accordance with ASTM C88.
- C. Facing stone size and gradation as indicated and uniformly graded.
- D. Shape:
 - 1. Suitable to form protective structure.

2. Generally angular, may use rounded cobbles or boulders for slopes flatter than 2 horizontal to 1 vertical.
3. Flat or needle shapes NOT ACCEPTABLE, unless thickness greater than 1/3 length.

2.2 RIPRAP

- A. Riprap crusher stone shall be hard durable, angular in shape, resistant to weathering and to water action; free from overburden, spoil, and organic material; and shall meet the gradation requirements for the class specified. Shale and stone with shale seams are not acceptable. The minimum weight of the stone shall be 150 lb/cf.

Size of Stone	Percent of Total Weight Smaller than
150 lb	100
100 lb	80
50 lb	25
25 lb	10

2.3 GRAVEL

- A. Conform to requirements specified in Section 02210.

2.4 MATERIAL SOURCE

- A. Obtain from rock excavation under contract, if meeting above requirements.

PART 3 - EXECUTION

3.1 PLACEMENT

- A. Trim and dress areas to conform to lines and grades indicated.
- B. Place spread, and compact bank-run gravel backing where indicated.
- C. Choke voids and interstices in existing rock fill with bank-run gravel and sand by jetting method.
- D. Excavate footing trench along slope toe as indicated, and place larger rocks there.
- E. Placing rocks:

1. Provide minimum voids.
 2. Place larger rocks in foundation course and on outside of slope protection.
 3. Dumping and spreading by equipment is ACCEPTABLE.
- F. Dress up outer facing to render.
1. Smooth surface
 2. Irregularities not more than 0.5 ft measured normal to the slope.
- G. Chink voids in outer facing with smaller stones. Remove loose stones.
- H. Fill footing trench with excavated material without compaction.
- 3.2 CONTRACT CLOSEOUT
- A. Provide in accordance with Section 01700.

END OF SECTION 02271

SECTION 02273

GEOTEXTILE FABRIC

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide geotextile fabric for separation of existing soil from crushed stone.
- B. Provide geotextile fabric for silt fence as indicated or specified.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS.
 - 1. At least two weeks prior to shipment, submit manufacturer's certificate of compliance and physical property data sheet indicating that requirements for materials and manufacture are in conformance as specified.
 - 2. For informational purposes only, submit manufacturer's printed installation instructions.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. General:
 - 1. Producer of geotextile fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures. Laboratory to maintain records of quality control results.
 - 2. Do not expose geotextile fabric, except the geotextile fabric for silt fence, to ultraviolet radiation (sunlight) for more than 14 days total in period of time following manufacture until geotextile fabric is installed and covered with fill or backfill material.
 - 3. Take all precautions to protect geotextile fabric from damage resulting from any cause. Either repair or replace geotextile fabric to Engineer's satisfaction at no additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. Provide geotextile fabric in rolls wrapped with protective covering to protect geotextile fabric from mud, dirt, dust, and debris. Label each roll of geotextile fabric with number or symbol to identify production run.
- C. Protect geotextile fabric from sunlight during transportation and storage. Do not leave geotextile fabric exposed to sunlight for more than two weeks during installation operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide the following nonwoven geotextile fabric:
 - 1. Trevira 011/200 as manufactured by Hoechst Celanese Corp., Spartanburg, South Carolina.
 - 2. Mirafi 160N as manufactured by Mirafi, Pendergrass, GA.
 - 3. Amoco 4551 as manufactured by Amoco Fabrics and Fibers Co., Atlanta, GA.
 - 4. Or acceptable equivalent product.
- B. Provide the following woven geotextile fabric for silt fence:
 - 1. Amoco 2122 as manufactured by Amoco Fabrics and Fibers Co., Atlanta, GA.
 - 2. Mirafi 100X as manufactured by Mirafi, Pendergrass, GA.
 - 3. Geotex 910SC as manufactured by Synthetic Industry, Chattanooga, TN.
 - 4. Or acceptable equivalent product.

2.2 MATERIAL

- A. Geotextile fabric shall conform to test requirements for minimum average roll value (weakest principle direction) for strength properties of any individual roll tested from manufacturing lot or lots of particular shipment in excess of minimum average roll value (weakest principle direction) as specified hereafter:
- B. Physical Properties of Minimum Average Roll of nonwoven geotextile fabric for placement between natural sand and rip rap and as the separation layer between

the native soil and the crushed stone working mat below drainage structures shall be:

Property	ASTM Test Method	Units	Value
1. Grab Strength	D4632	lbs [N]	150 [670](min.)
2. Grab Elongation	D4632	%	50 (min.)
3. Trapezoidal Tear Strength	D4533	lbs [N]	60 [270](min.)
4. Puncture Strength	D4833	lbs [N]	75 [330](min.)
5. Permittivity	D4491	sec -1	1.3 (min.)
6. Apparent Opening Size	D4751	Sieve Number	70-100
7. Ultraviolet Stability	D4355	Percent	70 (min.)

C. 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. Permittivity	D4491	sec -1	0.10 (min.)
3. Apparent Opening Size	D4751	Sieve Number	20-30
4. Ultraviolet Stability	D4355	Percent	70 (min.)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install geotextile fabric in accordance with manufacturer's printed instructions.
- B. Overlap geotextile fabric 18 inches minimum for unsewn lap joint. Overlap fabric 6 inches at seam for sewn joint.
- C. Do not permit traffic or construction equipment to travel directly on geotextile fabric.
- D. Place geotextile fabric in relatively smooth condition to prevent tearing or puncturing. Lay geotextile fabric loosely but without wrinkles or creases so that placement of the backfill materials will not stretch or tear geotextile fabric. Leave sufficient slack in geotextile fabric around irregularities to allow for readjustments.

- E. Patch all tears in geotextile fabric by placing additional section of geotextile fabric over tear with a minimum of 3 feet overlay.
 - F. Install silt fence in accordance with the manufacturer's printed instructions and as indicated.
- 3.2 CONTRACT CLOSEOUT
- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02273

SECTION 02480

LANDSCAPING

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 includes the following:
 - 1. Providing loam, fertilizer, seed, plants and related work as specified.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Certify, invoice, and order plants for each shipment grown, free of disease and insect pests. Submit certificates to Engineer.
 - 2. Prior to placement of any mulch, deposit, at a location on site suitable to Engineer, 1/2 cu. yd. sample of mulch for examination. After mulch sample is reviewed by the Engineer, provide mulch conforming to accepted sample.
 - 3. Submit to Engineer a sample of proposed soil separator mat and manufacturer's specification for mat.
 - 4. Submit with seed, certificates concerning seed mixture, purity, germinating value, and crop year identification.
 - 5. Submit test samples of loam to a certified soils consultant to determine fertilizer and lime requirements and return two copies of results for implementation.
 - 6. If hydroseeding is to be used, provide written description containing seed analysis, fertilizer, and lime addition data.
 - 7. Submit list of plant material to be used and source.
 - 8. Prior to end of maintenance period, furnish two copies of written maintenance, instructions for maintenance and care of installed plants and lawn areas.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. Ability to Deliver:
 - 1. Investigate sources of supply and make assurances that plants will be supplied as indicated in Schedule of Plant Material in sizes, variety and quality noted and specified before submitting bid.
 - 2. Failure to take this precaution will not relieve responsibility for furnishing and installing plant material in accordance with Contract requirements and without additional expense to OWNER.
- C. Inspection:
 - 1. Upon delivery and before planting, Engineer will inspect plants.
 - 2. Inspection and approval by Engineer of plants is for quality, size and variety only and in no way impairs the right of rejection for failure to meet other requirements during progress of work.
- D. General:
 - 1. Provide only nursery grown plants having been transplanted at least once and growing in a nursery for at least two years.
 - 2. Allow Engineer to determine fitness of any plant.
 - 3. Provide container grown stock in containers long enough for root system to develop sufficiently to hold soil together firm and whole when removed from container. Use no plants loose in the container.
 - 4. Check plant material prior to commencing of planting operations. Plant no material prior to inspection by Engineer. Notify Engineer at least 48 hours in advance of all planned planting operations and identify specific material and its location.
 - 5. Furnish suitable quantities of water, hose and appurtenances.
 - 6. Use loam, having prior vegetative growth that did not contain toxic amounts of either acid or alkaline elements.
 - 7. Begin maintenance immediately after each portion of lawn is seeded and continue for minimum of 45 days.

8. Repair or replace seeded areas, plants, shrubs, and trees which, in judgment of Engineer, have not survived and grown in a satisfactory manner, for a period of one year after acceptance.
9. Provide as specified seedlings or plantings replacements of the same type and size as specified.
10. Dry loam test samples to constant weight at temperature of 230 deg. F, plus or minus 9 degrees.
11. The Engineer reserves the right to test and reject any material not meeting specifications by utilizing tests in accordance with methods adopted by the Association of Official Agricultural Chemists. Costs for these tests shall be paid by the Contractor.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01610 and as specified.
- B. Preparation for Delivery:
 1. Balled and Burlapped (B & B) Plants:
 - a. Dig and prepare for shipment in manner that will not damage roots, branches, shape, and future development of plant.
 - b. B & B Plants: Originate from soil which will hold a good ball and be wrapped with burlap or similar approved material, bound with twine or cord in such manner as to hold balls firm and intact.
 - c. Ball Sizes: Not less than standard established by the American Association of Nurserymen for B & B stock.
- C. Delivery:
 1. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to state law.
 2. Delivery plants with legible identification labels:
 - a. Label trees, evergreens, shrubs, and ground cover with waterproof labels which will remain legible for at least 60-days.
 - b. Label with correct plant name and size as indicated in Plant List.
 3. Protect plants during delivery to prevent damage to roots or desiccation of leaves.

4. Notify Engineer of delivery schedule in advance so plant material may be inspected at jobsite.

D. Storage:

1. Store plants in ground or other acceptable media if not to be planted within 4-hrs.
2. Protect roots of plant material from drying or other possible injury.
3. Water plants as necessary until planted.

E. Handling:

1. Do not drop plants.
2. Do not pick up container or B & B plants by stem or trunks.

1.6 JOB CONDITIONS

- A. It is the intent of this specification that existing trees within grading and seeding limits, not disturbed by building operations, be saved and protected, except where specified to be removed. Clear trees required to be removed only after approval by Engineer. Engineer directs variations required in grading on the job.

B. Planting Seasons:

1. Recommended Spring Planting Season: From time soil can be satisfactorily worked until following dates at end of planting season:
 - a. Evergreens - May 1.
 - b. Trees and Shrubs - May 15.
 - c. Lawns - April 15.
2. Recommended Fall Planting Season: Commence and terminate at time listed below:
 - a. Evergreens - August 20 to September 30.
 - b. Trees and Shrubs - From dormancy to November 30.
 - c. Lawns - August 1 to October 1.

- C. Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

D. Protection:

1. Protect seeded and planted areas against damage by trespass and other causes.
2. Protect work until accepted.
3. Replace, repair, restake, or replant as directed by Engineer, and at own expense, seeding or planting which is damaged.
4. If planting is done after lawn preparation, protect lawn areas, repair damage resulting from planting operations.

E. Wherever landscape work must be executed in conjunction with construction of other work, arrange a schedule of procedure that will permit execution of landscape work as specified.

1.7 WARRANTY

- A. Provide in accordance with Section 01740 and as specified.
- B. Guarantee new plant material through one full growing season after plants are installed.
1. Guarantee plants replaced under this for one full growing season from date of replacement.
 2. Repair damage to plants or lawns during plant replacement.
- C. Guarantee lawn areas for duration of one full year after seeding to be alive and in satisfactory growth at end of guarantee period.
1. For purpose of establishing an acceptable standard, scattered bare spots, none of which is larger than 1 sq. ft. will be allowed up to a maximum of 3% of lawn area.

PART 2 - PRODUCTS

2.1 PLANTS

- A. Provide plants in accordance with ANSI Standard for Nursery Stock, Designation Z60.1, latest edition.
- B. Plant Material: Vigorous, healthy, well-formed upper growth and dense, fibrous and large root system, and free of insect or mechanical damage. Grown under climatic conditions similar to those in project locality.
- C. Plants, except those specified as container grown, balled in burlap with root ball formed of firm earth from original and undisturbed soil.

1. Ball width, depth and lacing as specified in SCHEDULE OF PLANT MATERIAL. Do not accept balled and burlapped plants with broken or loose balls, or of "manufactured" earth or peat humus.
- 2.2 BONE MEAL
 - A. Commercial raw bone meal, finely ground and containing a minimum of 1 percent nitrogen and 18 percent phosphoric acid.
- 2.3 STAKES
 - A. Wood stakes, minimum of 2-in. by 2-in. square and 8 feet in length, of uniform size, straight, reasonably free from knots, treated with wood preservative and painted green.
- 2.4 WIRE
 - A. Two strands No. 14-gage galvanized soft ferrous wire, twisted, for tree guying.
- 2.5 HOSE COLLAR
 - A. Good quality reinforced rubber hose of minimum 1/2-in. inside diameter and green in color, for protecting tree bark from supporting wires.
- 2.6 TREE WRAP
 - A. Quality, heavy, waterproof crepe paper manufactured for this purpose. Width of material not less than 6 inches, and wrapped from bottom with minimum 2 in. overlap.
- 2.7 ANTIDESICCANT
 - A. Acceptable antidesiccant emulsion which provides a film over plant surfaces permeable enough to permit transpiration.
 - B. Applied to evergreen trees, shrubs and all deciduous plant material. Application made prior to transportation from nursery if deciduous trees are leafed out at time of digging. The rate and method of application shall be in accordance with the manufacturer's recommendations.
- 2.8 MULCH
 - A. Shredded pine bark free of wood chips, stones, branches or other deleterious material. Bark shredded in strips not larger than 3 inches in any dimension and aged for period of not less than six months after removal from original logs.

2.9 METAL EDGE STRIPS AND STEEL STAKES

- A. 1/4-in. by 5-inch steel plate edge strips, painted green.
- B. 16-in. tapered steel stakes.

2.10 MAT

- A. 1/4-in. to 1/2-in. thick mat consisting of lime or silicate glass fibers with average fiber diameter to 9 microns and 2-in. to 4-in. strands of fiber bonded with phenol formaldehyde resin, 100 percent textile glass fiber, roll type, water permeable with a minimum thickness of 1/4-in., a maximum thickness of 1/2-in. and a density of not less than 3 pounds per cubic foot.

2.11 LOAM

- A. Fertile, friable, natural topsoil typical of locality, without admixture of subsoil, refuse or other foreign materials, and obtained from well-drained arable site. Free of stumps, roots, heavy or stiff clay, stones larger than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other deleterious matter.
- B. Not less than 4 percent nor more than 20 percent organic matter as determined by loss on ignition of oven-dried samples.

2.12 LIME, FERTILIZER AND SEED

- A. Ground agricultural limestone containing not less than 85 percent of total carbonates.
- B. Commercial type fertilizer, uniform in composition, free flowing, conforming to state and federal laws, and at least 50 percent of nitrogen derived from natural organic sources of ureaform and containing following percentages by weight: Nitrogen 10 percent, Phosphorus 10 percent, Potash 10 percent.
- C. Turf grass seed, inside perimeter fence, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum proportion by weight	Percent purity	Percent germination
Kentucky bluegrass	20%	87%	85%
Merio Kentucky bluegrass	20%	87%	85%
Red Chewings Fescue	45%	98%	85%
Manhattan Rye	15%	98%	90%

- D. Turf grass seed, outside perimeter fence, clean high in germinating value and of the latest year's crop mixed as follows:

Name	Minimum proportion by weight
Creeping Red Fescue	50%
Domestic Ryegrass	20%
Redtop	5%
Kentucky Bluegrass	25%

- E. Weeds shall not exceed 0.25 percent.

2.13 SOD

- A. Established, nursery grown Kentucky or Merion Bluegrass sod, vigorous, well rooted, healthy turf, free from disease, insect pests, weeds, other grasses, stones, and any other harmful or deleterious matter.
- B. Sod harvested by machine at uniform soil thickness of approximately 1 inch but not less than 3/4 of an inch. Measurement for thickness excludes top growth and thatch. Prevent tearing, breaking, drying or any other damage.

2.14 CRUSHED STONE

- A. Crushed stone made from light colored granite. Stone screened to insure uniformity of size. No flat, elongated stone used. Size of stone in mowing strips and other areas as indicated on drawings, conforming to following requirements:

Size of square screen	Percent passing
1-1/4 inch	95% minimum
3/4 inch	15% maximum

2.15 PEAT MOSS:

- A. Shredded, loose, substantially free of mineral and waste matters.
- B. Minimum organic matter by weight on a dry basis: 80 percent.

PART 3 - EXECUTION

3.1 PLANTING PITS

- A. Excavate with vertical sides and in accordance with following requirements:
1. Excavate tree pits to minimum of 2 feet greater in diameter than root ball of tree and sufficiently deep to allow for 1-foot thick layer of planting soil mixture below root ball.

2. Plant shrubs in pits 12 inches greater in width than diameter of root ball or container and minimum of 18 inches deep below finished grade, or as necessary to properly set plant at finished grade.
- B. Adjust depth of planting beds and pits to provide minimum of 8 inches of planting soil mixtures under roots of all plants.
- C. Set plants in center of pits, plumb and straight and at level that top of root ball is 1 inch lower than surrounding finished grade after settlement.
- D. Compact topsoil mixture thoroughly around base of root ball to fill all voids, when plant material is set. Cut all burlap and lacing and remove from top 1/3 of root ball. Do not pull burlap from under any root ball. Backfill tree and shrub pits halfway with planting soil mixture and thoroughly puddle before backfilling tree or shrub pit. Water tree or shrub, again, when each backfill operation is complete.

3.2 PLANTING SOIL MIXTURE

- A. Thoroughly mix all loam used in backfilling planting pits, with peat moss at rate of 2 parts loam to 1 part peat moss, to obtain required planting soil mixture.

3.3 BONE MEAL

- A. Add bone meal to planting mixture used for backfilling tree and shrub pits in following amounts:

	Quantity (lb)	Plant Size
Shrubs*	3/5	all
Minor trees	1	3'-4' hgt.
	1-1/2	4'-5' hgt.
	2	5'-6' hgt.
	3	6'-8' hgt.
	5	8'-10' hgt.
	7	10'-12' hgt.
Major trees	5	2-1/2" to 3" cal.
	7	3"-4-1/2" cal.

* Do not apply bone meal to rhododendrons and azaleas.

3.4 PLANTING

- A. Thoroughly compact topsoil planting mixture around root balls and water. Immediately after plant pit is backfilled, form a shallow saucer slightly larger than pit with ridge of soil to facilitate and contain watering. After planting, cultivate soil in all shrub beds between shrub pits. Grub out sod or other growth and remove from bed area. Rake bed area smooth and neat and outline. Mulch all tree pits and shrub beds with a minimum of 3 inches of shredded pine bark mulch as indicated on drawings. Do not use admixture of wood chips in mulch.

3.5 SECURING AND PROTECTING

- A. Install tree guying and staking as indicated in details.
- B. Install hose collars for protecting tree bark.

3.6 PRUNING

- A. Prune each tree and shrub in accordance with American Association of Nurserymen standards to preserve natural form and character of plant.
- B. Remove all dead wood, suckers and broken or badly bruised branches. In addition, remove 1/4 to 1/3 of remaining wood. Do all pruning with clean, sharp tools by workmen thoroughly familiar with this type of work. Paint cuts in excess of 1 inch in diameter with acceptable tree paint. Cover all exposed cambium, as well as other exposed living tissue, with paint. Do not remove leaders.
- C. Apply antidesiccant to all evergreen trees and shrubs and to all deciduous plant materials which are leafed out at time of planting. Follow manufacturer's recommendations regarding rate and method of application.

3.7 BARK MULCH SURFACES

- A. Mulch, with shredded pine bark, all tree pits, shrub pits and beds, and all areas planted with ground cover, immediately after planting operations are completed.
 - 1. For tree and shrub pits and beds, provide a minimum 3 in. of mulch.
 - 2. For ground cover beds, provide a minimum 2 in. of mulch.
- B. Limit mulching for trees and individual shrubs to pit area inside of saucer and for shrub, tree and ground cover beds and panels planted with multiple trees. Define limits of beds in turf areas or where no building wall or curb exists by installed metal edging as indicated.

3.8 METAL EDGE STRIPS

- A. Install metal edge strips around all edges of mowing strips and planting beds as indicated. Fasten metal edge strips securely in place with tapered steel stakes driven through slots punched in strip at 30-inch intervals. Set edge strips to finished grades indicated.

3.9 MOWING STRIPS AND AREAS OF CRUSHED STONE

- A. Construct mowing strips adjacent to all exterior building and structure walls where indicated on drawings. Provide mowing strips with metal edge strips.

- B. Install mat under crushed stone and pin in place.
- C. Place 6-in. minimum layer of crushed stone between edge strip and building or structure. Consolidate stone by means satisfactory to Engineer.

3.10 LOAM

- A. Spread loam on areas to be seeded, to required depth indicated on Contract Drawings or as directed by Engineer, fine grade and compact. Specified depth shall be that after compaction.

3.11 LIME, FERTILIZER AND SEEDING

- A. Apply lime by mechanical means at rate of 50 pounds per 1,000 sq. ft., or as soil analysis recommends.
- B. Apply fertilizer at rate of 50 pounds per 1,000 sq. ft., or as soil analysis recommends.
- C. Remove weeds or replace loam and reestablish finish grades, if any delays in seeding lawn areas and weeds grow on surface or loam is washed out prior to sowing seed and without additional compensation. Sow seed at rate of 4 pounds per 1,000 sq. ft. on calm day, by mechanical means. Sow one-half of seed in one direction, and other half at right angles to original direction. Rake seed lightly into loam, to depth of not more than 1/4 inch and compact by means of an acceptable lawn roller weighing 100 to 150 pounds per linear foot of width.
- D. Water lawn areas adequately at time of sowing and daily thereafter with fine spray, and continue throughout maintenance and protection period.
- E. Loam, lime, fertilize and seed required areas outside of perimeter same as lawn areas. Apply seed at rate of 80 pounds per acre. Rake seed lightly, after sowing, into top 1/4 in. of loam, and compact by suitable rollers weighing 100 to 150 pounds per linear foot of width.

3.12 SOD

- A. Install sod not more than 48 hours after cutting. Provide lime, fertilizer, etc, preparation for sod same as stated above for seed.

3.13 CRUSHED STONE

- A. Place crushed stone to depth of 6 inches, and thoroughly consolidate by means of suitable vibrator or mechanical tamper. Add stone, as necessary, after tamping or vibrating to finish depth of 6 inches.

3.14 CLEAN-UP

- A. Remove soil or similar material which has been brought onto paved areas, keeping these areas clean.
- B. Upon completion of planting, remove excess soil, stones and debris which has not previously been cleaned up and legally dispose of off-site.
- C. Prepare lawns and planting areas for final inspection.
- D. Protect slopes and embankments against erosion until work is accepted. Repair eroded portions of seeded or sodded areas by refilling, resodding, mulching and reseeding as required by condition and to satisfaction of Engineer. Protection may be by installation of sod strips or other methods.

3.15 MAINTENANCE - SEEDED AREAS AND PLANTING

- A. Maintain lawn areas and other seed areas at maximum height of 2-1/2 inches by mowing at least three times. Weed thoroughly once and maintained until time of final acceptance. Reseed and refertilize with original mixtures, watering or whatever is necessary to establish over entire area of lawn and other seeded areas a close stand of grasses specified, and reasonably free of weeds and undesirable coarse native grasses.
- B. Begin maintenance immediately after each planting and continue until final acceptance of work. Water, mulch, weed, prune, spray, fertilize, cultivate and otherwise maintain and protect all plants.
- C. Reset settled plants to proper grade and position, and restore planting saucers and remove dead material. Tighten and repair guys. Correct defective work as soon as possible within guarantee period.

3.16 INSPECTION FOR ACCEPTANCE

- A. Upon written request by the Contractor, the Engineer shall inspect all lawn areas to determine completion of contract work. This request must be submitted at least 10 days prior to the anticipated date. The lawns will become acceptable if they show a uniform, thick, well developed stand of grass that may be occupied by the Owner for their intended use. When acceptance is made in writing to the Contractor, the Contractor's responsibility for maintenance shall terminate.
- B. The Contractor shall furnish to the Owner complete written instructions for maintenance of all lawn areas at time of acceptance.
- C. Acceptance of the lawn area shall not occur before acceptance of the entire facility.

3.17 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.
- END OF SECTION 02480

SECTION 02498

RESTORATION OF DISTURBED AREAS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide all plant, labor, equipment, appliances and materials, and in performing all operations in connection with restoration to preconstruction conditions of all areas affected by work under this Contract, complete in accordance with the drawings and specifications.

1.3 GENERAL DESCRIPTION

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.

Contractor shall make arrangements and notify property owners 72 hours prior to work which will affect their properties and indicate what will be done to restore the area after construction is completed.

Contractor shall notify all utility companies and local, state and federal authorities which will be affected by his work 72 hours prior to beginning work.

The Contractor on or before the completion of the work, except as otherwise expressly directed or permitted in writing by the Owner, shall tear down and remove and legally dispose of all temporary structures built or used; shall remove all rubbish and debris of all kinds from all Contract structures and from any grounds which he shall have occupied within the limits of the project site; shall leave the site of the work in a satisfactorily neat and clean condition; shall remove from the land all abandoned materials and plant; and shall leave the spoil areas and the property which may have been affected by his operations in a neat and satisfactory condition. Also included is the restoration of all private grounds, including lawns, landscaped areas, driveway aprons and walkways damaged or disturbed in connection with the new work not elsewhere specified. Unless otherwise specified, all materials salvaged and not required to be reused shall be the property of the Contractor, and shall be legally disposed of off the site of the work.

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.

Remove and reset or replace all fencing, guardrails, lawns, posts, curbing, signs, roadways, driveways, sidewalks, and other items which interfere with the progress of the work. Shore or guy any utility pole as required by the utility company.

Included in the work under this Section is the restoration, including replacement of damaged and disturbed shrubs and trees, retaining walls, of all grounds and grassed and landscaped areas removed or disturbed or damaged during the construction of the new work, including pipe laterals within private property areas, and storage and field office areas.

Also included in the work under this Section is the furnishing of all labor, materials, and equipment required to remove, store, and reset or replace bumper posts, stone walls of all types, flagstone walks, fences of all types, railings, signs and sign posts, signal posts, and such other miscellaneous objects damaged or disturbed during construction.

Wherever streets, lawns, roadways, driveways or sidewalks within or outside the contract limit lines have been excavated in fulfilling the work required under this Contract, the Contractor shall furnish and install all materials to bring finished surfaces level with the existing adjacent surfaces and returned to its original condition.

If, during the progress of the contract work, any water pipe, sewer, conduit, drain, or other utility (public or private) is damaged as a result of operations under this Contract, the Contractor, as determined by the Engineer, shall repair all such damage and restore work to its original condition, at no additional expense to Owner.

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.

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.

Restoration work shall be completed to the satisfaction of the Engineer. Work not

deemed satisfactory by the Engineer shall be redone by the Contractor at the Contractor's expense.

1.4 TRENCHES NOT IN PAVED AREAS

- A. Where the trench occurs adjacent to paved streets in shoulders, sidewalks, or in cross-country areas, the Contractor shall thoroughly mechanically compact the backfill and shall maintain the surface as the work progresses. If settlement takes place, the Contractor shall immediately deposit additional fill to restore the level of the ground. In areas adjacent to streets and highways which are not to be loam and seeded, the top 12-inch layer of trench backfill shall consist of compacted dense-blend gravel borrow or sand and gravel as required to match existing conditions. Trench backfill in unpaved roadways shall have the top 12-inch layer of backfill consist of compacted sand and gravel.
- B. If in the opinion of the Engineer, the top 12-inch layer is unsuitable for use as base course, he may order the Contractor to remove this layer and to provide material that meets specifications.

END OF SECTION 02498

SECTION 02500

PAVING AND SURFACING

PART 1 – GENERAL

1.1 SUMMARY

- A. This section specifies following: installation of pavement on all roadway and parking areas; trench pavement; pavement reclamation for subbase; cold planning; fine grading and compacting; and adjustment of castings as indicated and specified.
- B. Pavement and surfacing shall be constructed in courses as shown on the plans and as directed in accordance with these specifications and in close conformity with the lines, grades, compacted thickness and typical cross section shown on the plans.
- C. The Contractor shall take all reasonable measures to assure proper drainage on the final surface of the roadway. Pavement that does not drain properly due to poor workmanship shall not be accepted by the Owner and shall be replaced by the Contractor at no additional cost to the Owner.
- D. Reference is made herein to the Commonwealth of Massachusetts, Department of Public Works, Massachusetts Department of Transportation, Standard Specifications for Highways and Bridges, latest edition, hereinafter referred to as the “MassDOT”. All references to method of measurement, basis of payment, and payment items in the Standard specifications are hereby deleted. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned therein.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02524 – CURBS, WALKS AND DRIVEWAYS
- D. Section 02590 – BRICK MASONRY
- E. Section 03300 – CAST-IN-PLACE CONCRETE

1.3 SUBMITTALS

- A. Submit the following in accordance with the General Conditions of Contract and Section 01300 – SUBMITTALS:

B. Shop Drawings:

1. Manufacturer product data, specifications and certificates for all materials including but not limited to:
 - a. Bituminous Concrete base, binder and top, including design mix for roadway and parking area pavement.
 - b. Gravel Subbase – Submit in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
 - c. Brick and Mortar – Submit in accordance with Section 02590 – BRICK MASONRY
2. Infrared pavement sealing equipment specifications.

C. The Contractor shall submit grain size analysis and moisture density curve performed in accordance with ASTM D422 of the reclaimed pavement material to be reused as subbase. The analysis shall be completed in order to compaction test the reclaimed pavement to be used a subbase. The grain size analysis shall indicate that the material conforms to the gradation requirements specified.

1. Submit additional grain size analysis, moisture density curve and certifications for every 1000 cubic yards (every 200 cubic yards for moisture density curves) of material or anytime consistency of material changes in the opinion of the Engineer. Submit associated chemical laboratory data on the imported materials throughout the course of the Work, if requested by the Engineer, to evaluate the consistency of the source or process, at no additional cost to the Owner.

D. Submit compaction testing results for all pavement layers and subbase.

E. Submit temperature testing results for all in-place pavement layers, pavement at time of delivery to the site, ambient air and subbase.

F. Submit Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.4.B, three (3) weeks prior to any testing.

1.4 QUALITY CONTROL

A. The Engineer may require the Contractor to remove at his/her own expense, any defective mix not conforming to the specified job mix formula within the stipulated tolerances. Samples of the actual mixture in use will be taken as many times daily as necessary and the mixtures shall be maintained uniform for the project. The Engineer may suspend further approval for use of the Plant mixtures if the mixtures do not conform to the specified requirements.

B. Materials shall not be placed when underlying surface is muddy, frozen, or has frost, snow, or water thereon.

- C. The Contractor shall repair or remove and replace unacceptable paving as directed by Engineer, and at no additional cost to the Owner.
- D. Independent Testing Laboratory: The Contractor shall employ an independent testing laboratory to perform the following tests:
 - 1. Particle size, gradation analyses and compaction testing for subbase. in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
 - 2. Particle size, gradation analyses and compaction testing for reclaimed subbase in accordance with the Standard Specifications.
 - 3. Compaction testing of all in place pavement courses. The density of the bituminous concrete pavement will be determined by using Nuclear Density Gauge Test - Method ASTM D2950.
 - 4. Temperature testing of all in place pavement courses, temperature testing of pavement at time of delivery, temperature of subbase and temperature of ambient air.
 - 5. Core samples of installed pavement to verify the thickness meets requirements.
- E. Grade Control:
 - 1. The Contractor shall employ at his own expense a Registered Land Surveyor to establish, maintain and ensure that the grades and thicknesses for road reconstruction is completed to the specified tolerances and design.
 - 2. The Contractor shall maintain the subbase grade within 0.25 inches plus or minus of the existing or design grades.
- F. Thickness Tolerances: The Contractor shall test in-place bituminous concrete courses for compliance with requirements for thickness. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
 - 1. Top Course: 1/4-inch, plus or minus.
 - 2. Binder Course: 1/4-inch, plus or minus.
 - 3. Base Course: 1/4-inch, plus or minus
- E. Bituminous Concrete Temperature Requirements: The Contractor shall supply an approved Dial Type Asphalt Thermometer (Range 0° F to 500° F) for each paving machine in operation on the project. The thermometer shall remain the property of the Contractor upon completion of the project.
 - 1. Refer to Section 1.5 below for delivery temperature requirements.

2. Temperature of bituminous concrete at the time of placement shall be in accordance with the table in Standard Specifications Section 460.61.

F. Weather and Date Limitations:

1. Apply prime and tack coats when ambient temperature is above 50 deg.F and when temperature has not been below 35 deg.F for 12 hours immediately prior to application. Do not apply when subbase is wet or contains an excess of moisture.
2. Binder for temporary pavement may be placed when air temperature is above 30 deg.F and rising.
3. Permanent bituminous concrete shall only be installed when atmospheric temperature is above 40 deg.F.
4. The Contractor shall not install permanent pavement between the dates of October 15th and April 15th unless written approval has been obtained from the Engineer.

G. Compaction Testing:

1. All bituminous mixtures shall be compacted to at least 95% of the density achieved on the laboratory testing of the design mix for the project. Density will be checked by the Nuclear Density Gage Method, ASTM D2950. Testing shall be completed by Contractor at no expense to Owner for every 200 square yards of surface area placed.
2. All subbase shall be compacted and testing in accordance with 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
3. All reclaimed subbase shall be compacted and tested in with the MassDOT Standard Specifications Section 403.64.

H. Core Samples: Core Samples to verify in place pavement thickness to be taken as directed; at least one core sample for every 200 square yards of surface area placed.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Batch ticket information shall be submitted to the Engineer upon placement of bituminous concrete.
- B. Transportation and delivery of bituminous concrete shall be in accordance with the MassDOT Standard Specifications Section 450.
 1. The temperature of the mix upon delivery to the project site shall be in accordance with the table in Section 450

1.6 DEFINITIONS

- A. Temporary Pavement: Temporary pavement shall mean temporary with regards to the duration of the contract. All temporary pavement shall be removed prior to the placement of permanent pavement. Bituminous concrete for temporary pavement shall meet the material requirements for Bituminous Concrete Binder Course as specified below.
- B. Full Depth Road Reconstruction: Full depth road reconstruction shall mean excavation and replacement of all existing pavement courses; including cobble, brick, cement concrete and bituminous concrete; and subbase to depth of subgrade.

1.7 REGULATIONS (Not Used)

1.8 GUARANTEE

- A. The Contractor shall maintain the surfacing for one year from the date of substantial completion and shall promptly fill with similar material in compliance with the specifications, any depressions and holes that may occur so as to keep the surfacing in a safe and satisfactory condition for traffic.
- B. The Contractor shall infrared seal the joints of all repairs made to the surfacing due to improper installation during the one-year guarantee period at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Gravel Subbase: Shall conform to MassDOT Standard Specifications M1.03.1.
- B. Bituminous Concrete Binder Course: Shall conform to the MassDOT Standard Specifications, M3.11.00 through M3.11.09, Class I Bituminous Concrete Pavement, Type I-1 – Binder Coarse.
- C. Bituminous Concrete Top Course: Shall conform to the MassDOT Standard Specifications, M3.11.00 through M3.11.09, Class I Bituminous Concrete Pavement, Type I-1 – Top Coarse.
- D. Bituminous Concrete Base Course: Shall conform to the MassDOT Standard Specifications, M3.11.00 through M3.11.09, Class I Bituminous Concrete Pavement, Type I-1 – Base Coarse.
- E. Bituminous Concrete for Sidewalk: Shall conform to the MassDOT Standard Specifications, M3.11.00 Class I Bituminous Concrete Pavement.
- F. Bituminous Concrete for Driveways: Shall conform to the MassDOT Standard Specifications, M3.11.00 through M3.11.09, Class I Bituminous Concrete Pavement, Type I-1 – Top Coarse.

- G. Tack coat shall be RS-1 emulsion.
- H. Asphalt emulsion shall conform to Standard Specification MassDOT Section M3 – M3.03.0 and shall be AC-20 conforming to AASHTO M226.
- I. Bituminous Concrete for Berms and Curbs: Shall conform to the MassDOT Standard Specifications, M3.11.00 through M3.11.09, Class I Bituminous Concrete Pavement, Type I-1 – Dense Mix.
- J. Hot Poured Rubberized Joint Sealer: Shall conform to the MassDOT Standard Specifications, M.3.05.0. The sealer shall meet the requirements of Federal Specification Number SS-S-1401.
- K. Reclaimed Pavement Subbase: Shall conform to the MassDOT Standard Specifications, M.1.11.0. Gradation requirements are included MassDOT below:

Sieve Designation	Percent Passing
3-inch	100
1½-inch	70 - 100
¾ - inch	50 - 85
No. 4	30 - 60
No. 50	8 - 24
No. 200	0 - 10

- L. Crack sealer: Crack sealer shall be asphalt slurry mixture type SS-1, SS-1h and shall be maintained at a significant fluidity to be able to flow into the hairline cracks

PART 3 – EXECUTION

3.1 SUBGRADE PREPARATION

- A. Bring subgrade to required grade as necessary prior to placing subbase material.
- B. As directed by the Engineer, over-excavate on-site fill material and any unacceptable materials below the subgrade. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the on-site fill material and unacceptable materials to avoid disturbance of the bearing surface.
- C. Backfill the overexcavation with crushed stone and compact as indicated in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING and in accordance with MassDOT Standard Specifications.
- D. Proof roll the subgrade prior to placing subbase.

3.2 PLACEMENT AND PREPARATION OF SUBBASE

- A. Do not begin placement of subbase and paving work until deficient subgrade

areas have been corrected and are ready to receive paving.

- B. Subbase under roadway shall be installed and compacted in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- C. The subbase and reclaimed subbase shall be fine graded and compacted for road reconstruction and where indicated in accordance with MassDOT Standard Specification Section 170.61.
- D. The subbase shall be spread in layers not more than 6-inches thick except the last layer of gravel shall be 3-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.

3.3 CLASS I BITUMINOUS CONCRETE BASE COURSE

- A. Base course shall be furnished and installed in accordance with MassDOT Standard Specification Section 420.

3.4 CLASS I BITUMINOUS CONCRETE FOR TEMPORARY PAVEMENT

A. SPREADING, FINISHING AND COMPACTING

- 1. Binder course shall be spread to a finished thickness of 2-inches. A smooth even surface shall be produced.
- 2. Binder course shall be compacted with a vibratory plate compactor or roller to produce a smooth even surface.
- 3. Binder course placement for temporary paving shall be installed on a weekly basis or as otherwise indicated by the Owner and Engineer. Cold patch for temporary pavement shall not be allowed.
- 4. Binder course placed as temporary paving shall be maintained until removed prior to final paving.
- 5. If requested and/or approved by the Engineer, Asphalt Cold Patch for temporary pavement shall be placed and compacted in two lifts to a total thickness of 2-inches.

3.5 CLASS I BITUMINOUS CONCRETE BINDER AND TOP COURSE

A. EXISTING PAVEMENT EDGES AND JOINTS

- 1. The edges of existing pavement which are to remain shall be saw cut to an even, straight edge. Trench edges shall be cut back one foot from edge of the trench on each side.
- 2. Air blast clean edges.

3. All joints at the junction of existing pavement (including recently placed mixtures) and binder course shall be sealed with an asphalt emulsion and covered with sand.
4. All joints at the junction of existing pavements (including recently placed mixtures) and the top course pavement shall be sealed with hot rubberized sealer. The use of hot rubberized sealer may be omitted at the Engineers discretion if the temperature of the existing mixture at the joint is above 203°F.
5. Construct joints to have same texture, density and smoothness as other sections of bituminous concrete course.
6. Overlap joints so that there is a least a one foot overlap between each coarse.
7. A keyway shall be provided at the limits of the full depth road reconstruction between the new roadway and the existing roadway as shown on the pavement joint detail.

B. TACK COAT

1. All contact surfaces shall be cleaned of all foreign matter and loose material and shall be dry before the tack coat is placed.
2. Supply tack coat at a rate of 0.05 to 0.10 gallons per square yard over the binder course. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.
3. The tack coat truck shall have pneumatic tires of such width and number that the load produced on the surface shall not exceed 12 kg/mm of tire width, and it shall be designed, equipped, and operated so that at an even heated emulsion may be applied uniformly on variable widths of surface at readily controlled rates from 0.05 to 0.30 gallons per square yard as directed by the Engineer.
4. The tack coat shall be applied within a pressure range of 0.17 to 0.52MPa. Distributor equipment shall include a tachometer, pressure gauges, volume-measuring devices, and a thermometer for reading the temperature of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.
5. The contact surfaces of manhole, catch basin and gate box frames and covers and other appurtenant structures in pavement shall be painted thoroughly with tack coat just before mixture is placed against them.

C. SPREADING AND FINISHING

1. Spreading and finishing of bituminous concrete binder and top course shall be completed in accordance with MassDOT Standard Specification Section 450.
2. The temperature of the bituminous concrete at the time of placement shall be in accordance with the table in MassDOT Standard Specification Section 450
3. Place pavement in strips not less than 2-feet wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete binder course for a section before placing top course.
4. Hand Spreading: Hand spreading will be permitted only for particular locations in the work which because irregularities, inaccessibility or other unavoidable obstacles do not allow mechanical spreading and finishing.
5. Immediately after placement of the new pavement, all joints between the existing and new pavement shall be sealed with RS-1 and sanded.

D. COMPACTION

1. Compaction of bituminous concrete shall be completed in accordance with MassDOT Standard Specification Section 480.
2. Begin rolling when mixture will bear roller weight without excessive displacement.
3. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
4. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.
5. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
6. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. CUTTING AND PATCHING

1. Remove and replace paving areas mixed with foreign materials and defective areas. Saw cut-out such areas and fill with fresh, hot bituminous concrete. Compact by rolling to match the surrounding surface density and smoothness.
2. All saw cut joints in surface coarse shall be sealed by infrared methods.

F. PROTECTION

1. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked by wheel traffic.

3.6 CRACK SEALING

- A. Prior to sealing a crack all compressible material shall be removed by high-pressure air or routing. If grass or vegetation is present in the crack the Contractor shall inject a liquid herbicide to prevent future growth.
- B. For larger cracks, sealing shall be with modified asphalts (e.g. hot rubberized asphalt sealer).
- C. For small hairline cracks, sealing shall be with the asphalt slurry mixture. The crack sealer shall be squeegeed over the surface and forced in the cracks.
- D. Sealing of all cracks shall be considered to be complete upon review and approval by the Engineer.

3.7 RAISING AND ADJUSTING CASTINGS

- A. Prior to installation of top layer of permanent paving, all existing catch basin castings, manhole castings, and valve boxes shall be raised, if necessary, to the proper grade by the Contractor.
- B. Castings owned by private utilities may be raised by the responsible utility. The Contractor shall be responsible for coordinating this work.
- C. Bituminous concrete courses shall be sawcut a minimum of 12" from outside edge of frame or for enough room to allow compaction by a vibratory plate compactor.
- D. Adjust casting with masonry work in accordance Section 02590 – BRICK MASONRY to grade. Adjustments shall be a maximum of 12" in height.
- E. The method of adjusting these castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8 inches from casting. Excavate and if required rebuild up to 10 inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting conforming to Section 03300.

Place high, early strength cement or bituminous concrete collar, as directed by the Engineer, to approximately 1½ inches below the raised casting grade. Masonry work shall conform to Sections 02252 and 02604, Manholes, and Catch Basins respectively.

- F. The method of raising valve boxes shall be as follows: Cut around valve box a minimum of 8 inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement or bituminous concrete collar, as directed, to approximately 1½ inches below the top of the valve box.
- G. Castings which need to be raised or adjusted to complete final top course full-width paving shall be done immediately prior to paving.

3.8 BITUMINOUS CONCRETE EXCAVATION BY COLD PLANER

- A. Keyways: The Contractor shall saw cut the limits of the cold plane excavation at the connection to existing pavement. A 1' wide by 4" deep key will be cold planed along the limits of the connection to existing pavement.
- B. Equipment: The Cold Planer shall be equipped with an elevating device capable of loading planed material directly into dump trucks while operative. The Cold Planer shall further have all necessary safety devices such as reflectors, headlights, taillights, flashing lights, and back-up signals so as to operate safely in traffic both in the day or at night. The Cold Planer shall be designed and built for planing flexible pavements and possess the ability to plane cement concrete patches when encountered in bituminous pavement. The Cold Planer shall be self-propelled and have the means for planing without tearing or gouging the underlying surface. The Cold Planer shall be adjustable as to crown and depth and shall meet the standards of the Air Quality Act for noise and air pollution.
- C. Variable lacing patterns shall be provided to permit a rough grooved surface as directed. A 2-inch (5cm) cut is required in one (1) pass. The minimum width of pavement planed in each pass shall be 6-feet (1.8m), except in areas to be trimmed and edged.
- E. The milled or planed surface shall conform generally to the existing grade and cross slope. The surface shall not be torn, gouged, shoved, broken or excessively grooved. It shall be free of imperfections in workmanship that prevent resurfacing after this operation. Excess material shall be swept and removed so that the surface is acceptable to traffic.
- F. The Contractor shall install bituminous concrete binder to the depth of the existing pavement at any areas, which as discovered after cold planning have no existing bituminous concrete.
- G. The Contractor shall maintain the cold planed road until the time of overlay by repairing any pot holes or damaged subbase with bituminous concrete binder at no additional cost to the Owner. The edges of existing base subbase shall be saw cut and tax coated.

1. Cold patch for repair shall be used to repair cold planed patches only after the approval of the Engineer and at no additional cost to the Owner. The Contractor shall remove all cold patch installed complete and replace with permanent bituminous concrete binder prior to completing the overlay at no additional cost to the Owner.
- H. The Contractor shall adjust all castings which do not match the existing pavement grade and slope, including coordinating with private utilities to adjust castings not owned by the City.

3.9 RECLAIMED BASE COURSE

- A. Equipment: Pulverization will be by means of a traveling pulvi-miller or equivalent machine capable of ripping through existing asphalt at depths up to 12" with one pass. The machine shall be self-propelled and be equipped with an adjustable grading blade, thus leaving its path generally smooth for traffic equipment. Road planers or cold milling machines, which are designed to mill or shred the existing bituminous concrete pavement rather than to crush or fracture it, are not considered capable of achieving specification gradation. The required and necessary scraping action of the milling shall provide an increase in the percentage of fine aggregate.
- B. Existing bituminous concrete and gravel base must be ripped and mixed so as to form a homogeneous mass of uniformly processed base material, which will bond together when compacted.
- C. The Contractor shall protect all existing casting, curb work and structures. All existing pavement on side streets, driveways and limits of work shall be saw cut and protected from damage.
- D. The pavement area to be reclaimed shall be swept with a power sweeper to remove all sand, dirt, organic matter, and other unsuitable materials.
- E. The Contractor shall reclaim only that area of pavement that can be processed and compacted by the end of the same working day. Reclaimed areas shall be acceptable for vehicular traffic at the end of each working day.
- F. The total thickness of the existing pavement and the uppermost portion of the subbase layer shall be recycled to the depth shown on the plans.
- G. If gradation deficiencies exist the appropriate crushed stone aggregate size shall be blended with recycled material to produce a uniform mixture meeting gradation requirements.
- H. Dense graded crushed stone shall be added for volume purposes if required.

3.10 INFRARED PAVING

- A. Equipment: The infrared heating system shall be capable of heating the existing bituminous concrete for rework up to a depth of 2" without flaming or altering the binding effect of the asphalt.

- B. The heated asphalt shall be removed and new hot mix asphalt shall be added to match the existing grades.
- C. The infrared paving repair shall be compacted in accordance with this section.
- D. Joints shall be sealed with asphalt emulsion

END OF SECTION 02500

SECTION 02524

CURBS, WALKS AND DRIVEWAYS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section specifies the following: cement concrete, bituminous concrete and brick sidewalks and driveways; wheelchair ramps; the removal and resetting of curb and edging; and the construction of new granite and bituminous curbs and edging.
- B. Reference is made herein to the Commonwealth of Massachusetts, Department of Public Works, Massachusetts Department of Transportation, Standard Specifications for Highways and Bridges, latest edition, hereinafter referred to as the “MassDOT”. All references to method of measurement, basis of payment, and payment items in the Standard Specifications are hereby deleted. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned therein.

1.2 RELATED WORK

- A. DIVISION 1– GENERAL REQUIREMENTS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02500 – PAVING AND SURFACING
- D. Section 03300 – CAST-IN-PLACE CONCRETE

1.3 SUBMITTALS

- A. Shop Drawings. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Manufacturer product data and specifications for all materials, including but not limited to:
 - a. Cement Concrete for sidewalks, driveways and wheelchair ramps including design mix
 - b. Micro-fiber for sidewalk reinforcement
 - c. Membrane Curing Compound
 - d. Alkaline Resistant Protective Penetrating Concrete Sealer
 - f. Expansion Joint
 - e. Granite Curb, Granite Curb Inlet, Granite Curb Corner and Granite Edging
 - f. Cement Concrete Design Mix for granite curb work

- g. Brick
 - h. Cement Concrete Brick Sidewalk Base including design mix
 - i. Stone Dust
 - j. Iron Edge
 - k. Bituminous concrete sidewalks, driveways, berms and waterways including design mix – Refer to Section 02500 – PAVING AND SURFACING for requirements
 - l. Gravel Subbase – Submit in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- 2. Detail drawings and layout plans for all materials.
 - 3. Two (2) sample bricks. The brick submittal shall conform to the requirements of this section for walks. Refer to SECTION 02590 – BRICK MASONRY for all other brick masonry submittal requirements.

B. Submit compaction testing results.

1.4 QUALITY CONTROL

- A. Cement and Bituminous concrete placement weather and temperature restrictions shall be in accordance with Section 03300 – CAST-IN-PLACE CONCRETE and Section 02500 – PAVING AND SURFACING.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with GENERAL SPECIFICATIONS
- B. Cement Concrete delivery time and storage time onsite shall be in accordance with Section 03300 – CAST-IN-PLACE CONCRETE.
- C. Batch ticket information shall be submitted to the Engineer upon placement of cement and bituminous concrete.

1.6 DEFINITIONS (Not Used)

1.7 REGULATIONS

- A. All wheelchair ramps shall conform to the applicable details of the MassDOT Wheelchair Ramp Standards (10/8/97 or subsequent edition), to the latest Architectural Barrier Act standards and to the latest ADA standards.

1.8 GUARANTEES

- A. The Contractor shall guarantee all work for one year from the date of Substantial Completion from damage due to improper installation and improper use.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Cement Concrete for Sidewalks, Driveways and Wheelchair Ramps: Cement concrete shall conform to the MassDOT Standard Specifications, M4.02.00 through M4.02.12 and be 4000 PSI at 28 day test, ¾-inch coarse aggregate, 610 pounds cement per cubic yard, 6% air entrained (AASHTO - M154), Type A water reducing admixture (AASHTO - M194), 3 to 4-inch slump, and Type II dark-colored by adding 1-1/2 to 2 lbs. of lamp black per cubic yard at the plant. Cement concrete shall contain micro-fiber added during batching at the plant to insure uniform distribution.
- B. Micro-fiber: The cement concrete shall contain 1 pound of polypropylene micro-fiber per cubic yard. Fibers shall be 1/2" or 3/4" 100% polypropylene fibers, maximum 3 denier, complying with ASTM C 1116, Type III, Par. 4.1.3. Fibers per pound shall be not less than 50 million individual fibers. The micro-fiber shall be used in accordance with the manufacturer's specifications.
- C. Curing Compound: Shall conform to Section 03300 – CAST-IN-PLACE CONCRETE for Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 percent Solids.
- D. Alkaline Resistant Protective Penetrating Concrete Sealer: Sealers shall be clear, VOC compliant and solvent-based. Sealer shall be deep penetrating.
- E. Expansion Joints: Shall be 3/8" thick polyethylene foam and ¼" thick polyethylene foam conforming to ASTM D1751.
- F. Bituminous Concrete for sidewalks, driveways, curbs, berms and waterways: Shall conform to the applicable subsections of Section 02500 – PAVING AND SURFACING.
- G. Brick shall be "City Hall pavers", manufactured by Stiles and Hart, Inc., Bridgewater, MA, or an approved equal.

The brick shall be clay brick, uniform in size and evenly burned, and when broken shall show a dense structure free from lime, air pockets, cracks and lamination. Brick shall have a color range of medium red to dark red, mixed with dark purple. Laminated bricks will not be accepted.

The bricks shall be for exterior walks and shall meet the requirements of ASTM C-902-Class SX Type I with average water absorption of not more than 5% with the five hour boil and an average compressive strength of 8,000 PSI (55Mpa) or more. Brick shall pass a minimum of 100 freeze thaw cycles.

- H. Stone Dust: Stone dust setting bed shall contain coarse as and aggregates mixed with the fine stone dust as processed by Rowe Contracting Company, Malden, Massachusetts or Quinn Perkins Company, Burlington, Massachusetts or approved equal, in order to add stability to the brick walk so that bricks will not roll, move

or rock. The stone dust for joint sweeping shall be mixed with Portland Cement Type II (2 parts Stone Dust to 1 part Portland Cement) and be free of coarse aggregates, enabling the fines to freely fill in around all sides of the bricks.

- I. Iron Edge: Sections shall be L-shaped galvanized steel paver restraints and are to be notched to provide for smooth curves and crisp angles. Sections shall conform to the following specifications: Height: 1.5", Flange: 1.75", Lengths: 6'0" or 8'0" and Thickness: 3/16".

Spikes are to be galvanized steel spiral not less than 10" in length.

Iron Edge to be supplied by Border Concepts, Inc., P.O. Box 471185, Charlotte, NC 28241, Telephone Numbers: 1-800-845-3343 or 1-704-541-5509, Fax Number: 1-704-541-5610 or approved equal.

- J. Cement Concrete Base Course for Brick Sidewalk and Driveway Base: The concrete base course shall be 3500 psi concrete at 28 day test, microfiber reinforced, 3/4-inch coarse aggregate, 610 pounds cement per cubic yard, 6% air entrained (AASHTO - M154), Type A water reducing admixture (AASHTO - M194), 3 to 4-inch slump.

- K. Granite curb, granite curb inlets, granite curb corners and granite edging: Shall conform to the MassDOT Standard Specifications Section M9.04.1, M9.04.5, M.9.04.6 and M9.04.2.

Granite Curb shall be Type VA4 per Standard Specification requirements. Locations are indicated on the Contract Drawings.

- L. Cement Grout: Shall conform to Section 03315 – GROUT.

- M. Cement Concrete for Granite Curb, Granite Curb Inlet, Granite Curb Corner and Granite Edging: Shall conform to Class A Concrete as indicated in Section 03300 – CAST-IN-PLACE CONCRETE

- N. Water: Potable.

- O. Gravel Subbase: Shall be in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

- P. Forms: Shall be in accordance with MASSDOT Standard Specification Section 701.61A

PART 3 – EXECUTION

3.1 PREPARATION

- A. The edges of existing pavement, which is to remain, shall be saw cut to an even, straight edge in accordance with Section 01045 – CUTTING AND PATCHING. This includes road, sidewalk and driveways.

- B. Excavate, remove, segregate and stockpile existing bituminous concrete, cement concrete and brick (including cement concrete subbase) walks and driveways as required for utility installation or as indicated for replacement on the Contract Drawings.
 - 1. Existing walks and driveways shall be sawcut at the limits of removal. Cement concrete walks and driveways shall be sawcut at existing score joint, so entire panel is removed.
 - 2. Prior to excavation for wheelchair ramps, the Contractor shall review the location with the Engineer to determine what is necessary to allow for the installation to be compliant with the standards referenced above. Fixed objects such as utility poles and fire hydrants must be considered in location of pedestrian ramps. The type of wheelchair ramp may vary based on sidewalk width and slope.
 - 3. Removed cement concrete, bituminous concrete, brick and reinforcement shall be disposed of in accordance with Section 02050 – DEMOLITION, MODIFICATION AND ABANDONMENT.
- C. Excavate, remove, protect and stack existing granite curb, granite edging, granite curb corners and granite curb inlets as required for utility installations or as indicated for replacement on the Contract Drawings in accordance with the MassDOT Standard Specifications Section 580.
 - 1. Granite curb, granite edging, granite curb corners and granite curb inlets not indicated to be reset shall be disposed of in accordance with Section 02050 – DEMOLITION, MODIFICATION AND ABANDONMENT
- D. Excavate, remove and stockpile existing bituminous concrete berms and curbs as required for utility installations or as indicated for replacement on the Contract Drawings.
 - 1. Removed, bituminous concrete berm and curb shall be disposed of in accordance with Section 02050 – DEMOLITION, MODIFICATION AND ABANDONMENT.
- E. The Contractor shall exercise special care when excavating near trees and roots.
- F. Traffic signs shall be removed as required during the excavation. Signs to be reused shall be appropriately protected, stacked and stored for reuse. Traffic signs to be replaced, as indicated on the Contract Drawings or as directed by the Engineer, shall be disposed of by the Contractor. Reinstallation of traffic signs shall be done the prior to the concrete pour. All regulatory signs shall be maintained throughout construction.
- G. Subgrade under walks, wheelchair ramps, driveways and curb work shall be graded to required elevations and proof rolled.

- H. Gravel subbase under sidewalks, wheelchair ramps, driveways and curb shall be graded to required elevations and compacted with plate-type mechanical compactors to ninety-five percent (95%) of the maximum dry density at optimum moisture content as determined by the AASHTO Standard Method of Test T99 Method.
 - 1. Existing in-situ material shall be used for gravel subbase only when approved by the Engineer. The Contractor shall provide analytical proctor results of the existing material in accordance with Section 02210 - EARTH EXCAVATION, BACKFILL, FILL, AND GRADING for compaction testing if requested by the Engineer.
 - 2. Imported gravel subbase shall be placed in one (1) six inch lift loose measure.
 - 3. Add approved material to bring to required grade and compact.
 - 4. The subbase for sidewalks shall be graded to be sloped from the City right of way towards the street at 1/8-inch to the foot, or as shown on the Contract Drawings, or as directed by the Engineer.
- I. Materials shall not be placed when subgrade and subbase is muddy, frozen, or has frost, snow, or water thereon.
- J. The Contractor shall raise all water curb stop boxes and sewer, drain, and combined sewer castings to final grade and shall coordinate raising of other utility boxes and castings prior to pouring of concrete. The Contractor shall remove material from curb stop boxes with compressed air, after raising is complete and prior to pouring of concrete. Prior to pouring the concrete, the Contractor shall review locations where curb boxes have been raised with the Engineer.

3.2 CEMENT CONCRETE WALKS AND DRIVEWAYS

- A. Concrete shall be installed to a depth of 6" across driveways. At all other locations, concrete shall be installed to a depth of 4".
- B. Forms shall be placed in accordance with MassDOT Standard Specification Section 701.61A.
- C. Concrete placement shall be in accordance with the MassDOT Standard Specifications Section 701.61B.
 - 1. The concrete shall be placed in alternating slabs 30 feet in length unless otherwise directed by the Engineer.
 - 2. The slabs shall be separated by transverse performed expansion joint filler as specified below:

- a. Expansion joints of 3/8" thick foam shall be placed every 30 feet perpendicular to curb alignment extending through the sidewalk depth. Expansion joints of 3/8" thick foam shall also be placed around all appurtenances such as utility poles, hydrants, manholes, and other obstructions extending into and through the sidewalk. Six inch expansion joints shall be placed at all locations where six inch concrete driveways meet four inch concrete walks. Expansion material protruding above the finished sidewalk shall be trimmed flush with a sharp instrument as soon as the concrete has set.
 - b. A 3/8" thick expansion joint shall be installed between all new cement concrete installations and existing cement concrete.
 3. The slabs shall be separated by the curb by longitudinal expansion joint filler as specified below:
 - a. Expansion joints of 1/4" thick foam shall be placed at 4" deep longitudinally along the granite curb between curb and the concrete and also between building, retaining wall and the concrete as directed by the Engineer. Expansion material protruding above the finished sidewalk shall be trimmed flush with a sharp instrument as soon as the concrete has set.
 4. In conveying the concrete from the place of mixing to the place of deposit, the operation shall be conducted in such a manner that no mortar will be lost and the concrete shall so be handled that the concrete will be of uniform composition throughout, showing neither excess nor lack of mortar in any one place.
- D. Concrete finishing shall be in accordance with the MassDOT Standard Specifications Section 701.61B.
1. No finishing operation shall be performed while free water is present. Finishing operations shall be delayed until all bleed water and water sheen has left the surface and concrete has started to stiffen.
 2. Between the expansion joints at 25 foot spacings, the sidewalk shall be divided at 5 foot intervals with score joints, made with creasing tools, having a penetration depth of minimum 1-1/2" and at 10 foot intervals with construction joints. Joints shall be placed 90° transverse with the direction of traffic and shall be straight within a tolerance of 1/4-inch of a straight edge laid along the joint. Longitudinal joints shall be installed, at the direction of the Engineer, when the sidewalk is greater than 6' wide.
 3. The surface shall be floated after completion of edging.
 4. Immediately after floating the surface shall be steel troweled. If necessary the joints and edges shall be rerun before and after troweling to maintain uniformity.

5. After troweling the surface shall be brushed by drawing a soft-bristled pushbroom with a long handle over the surface of the concrete to produce a non-slip surface.
- E. Concrete shall be membrane-cured. The curing compound shall not discolor the concrete and shall be applied according to the manufacturer's specifications. The mixture shall be applied immediately after the finishing is complete and free water has left the concrete's surface.
- F. Forms shall be left in place for a period of 12-hours prior to removal. Upon removal the Contractor shall backfill the void with loam in accordance with Section 02210 – EARTH EXCAVATION, FILL, BACKFILL AND GRADING and seeded, or match the existing material and grade as specified.
- G. Alkaline Resistant Protective Penetrating Concrete Sealer shall be applied to the concrete sidewalks after the concrete is at least 14 days old and after a 48-hour minimum drying period just prior to the time of treatment (if walk has become wet), the exposed surface shall be cleaned to remove all oil, grime and loose particles which would prevent the mixture from penetrating the concrete immediately before the application of the mixture, an air blast shall be directed over the surface to be treated so that all dust will be removed. Unless otherwise directed, the temperature of the concrete and air shall be 50°F or higher at the time of application. For the rate of application see Section 03300 – CAST-IN-PLACE CONCRETE. The second application of the surface treatment mixture shall not be made until the concrete, in the judgment of the Engineer, has regained its dry appearance.
- H. The Contractor shall fully protect all new concrete work for a minimum of forty-eight hours. A representative of the Contractor shall remain on site at least six (6) hours after the last section of concrete is placed. In addition, the contractor shall fully protect the concrete with plastic sheeting or matting. Plastic sheeting shall be installed so that it cannot pull or blow away under windy conditions and not damage installed concrete. Sidewalk vandalized or disturbed within six (6) hours after the last section of concrete is placed shall be replaced by the Contractor at no additional cost to the Owner.
- I. The Contractor shall furnish and install retaining wall as specified to meet back of sidewalk grade.

3.3 CEMENT CONCRETE WHEELCHAIR RAMPS

- A. Concrete shall be installed to a depth of 6" depth.
- B. The Contractor shall establish grade elevations at all wheelchair ramp locations, and shall set transition lengths according to the Curb Transition Lengths for Wheelchair Ramps Table – Drawing No. 107.9.0 in the Wheelchair Ramp Standards.

- C. All wheelchair ramps joints and transition sections which define grade changes shall be formed, staked, and checked prior to placing cement concrete. All grade changes are to be made at joints.
- D. At intersections, wheelchair ramps shall be located in front of vehicle stop lines and within the crosswalk. The ramp shall be constructed so that the finished elevation of the concrete (curb removed) will meet the roadway flush (less than ½" lip) for a width no less than forty-two (42) inches. The elevation at this meeting point shall be properly designed to meet the gutter elevation of the road. The Contractor shall install wheelchair ramps and road grades in a manner which minimizes the potential for puddles in front of them.
- E. The Contractor shall use a digital "Smart Level" to check all subbase grades for compliance prior to installation of concrete. The Contractor shall not proceed with concrete installation on a ramp that is out of compliance without first obtaining concurrence from the Engineer.
- F. Forming, placement, finishing, curing and alkaline resistant protective penetrating concrete sealer shall be completed in accordance with Paragraph 3.2 of this Section except the pushbroom finish, which shall be perpendicular to the direction of the slope.
- G. The Contractor shall furnish and install retaining wall as specified to meet back of sidewalk wheelchair ramps.

3.4 BRICK WALKS AND DRIVEWAYS

- A. Cement concrete base shall be installed to a depth of 4" and placed in accordance with the MassDOT Standard Specifications Section 701.61B
 - 1. Concrete surface shall be floated to remove irregularities prior to installing stone dust.
- B. The iron edge shall be installed as detailed, longitudinally to the granite curb at the back edge of the specified brick walk width and at all tree wells. The iron edge shall be secured by 10" spiral galvanized steel spikes placed every 12".
- C. A 1" (+/-1/2") stone dust setting bed shall be installed on the concrete base. Wet saw is required for cutting of bricks and filling in pieces where needed. No other method will be acceptable.
- D. After all the bricks are in place, stone dust free of coarse aggregates shall be swept into the voids around the bricks.
- E. Once the bricks are placed in their specified patterns, they shall be compacted with a plate compactor. The compactor shall have a minimum force of 5000 lbs. and a frequency of 75 to 90 cycles per second.

3.5 GRANITE CURB, GRANITE CURB CORNER, GRANITE CURB INLET AND

GRANITE EDGING

- A. New Granite Curb, Granite Curb Corners, Granite Curb Inlets and Granite Edging shall be installed in accordance with the requirements of Section 501 of the MassDOT Standard Specifications.
- B. Existing Granite Curb, Granite Curb Corners, Granite Curb Inlets and Granite Edging that is to be removed and reset shall be installed in accordance with the requirements of Section 580 of the MassDOT Standard Specifications.
 - 1. The Contractor shall verify and record all existing grades at locations which granite will be reset at the existing grade.
- C. Existing Granite Curb, Granite Curb Corners, Granite Curb Inlets and Granite Edging that is to be removed and stacked shall be installed in accordance with the requirements of Section 580 of the MassDOT Standard Specifications.
 - 1. Granite to be stacked at the Gloucester DPW. The Contractor shall coordinate the specific location with the Engineer
- D. Existing Granite Curb, Granite Curb Corners, Granite Curb Inlets and Granite Edging that is to be removed and discarded shall be installed in accordance with the requirements of Section 580 of the MassDOT Standard Specifications.
- E. Installations shall be backfilled with concrete as indicated on the Contract Drawings.

3.6 BITUMINOUS CURBS, BERMS, WALKS, DRIVEWAYS AND WATERWAYS

- A. Bituminous curbing and berms shall be placed where indicated in the Contract Documents or as directed by the Engineer.
 - 1. Curbing shall be machine layed and conform to grade of roadway and adjacent curb areas. Curbs shall be placed in accordance with Standard Specifications Section 501.64 for bituminous curb.
 - 2. Berms shall be machine layed and conform to the grade of the roadways. Berms shall be placed in accordance with Standard Specifications Section 470.20.
- B. Bituminous concrete walks shall be placed in accordance with the MassDOT Standard Specifications Section 701.62 except walks shall be machine placed. Spreading by hand methods will be permitted only for particular locations in the work which because of irregularity, inaccessibility or other unavoidable obstacles, do not allow mechanical spreading and finishing.
 - 1. Total sidewalk thickness shall be 3.75 inches and shall consist of a 2.5 inch thick binder coarse and a 1.25 inch thick Sidewalk mix top course.

- C. Bituminous concrete driveways shall be placed in accordance with the MassDOT Standard Specifications Section 701.63
- D. 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 MassDOT Standard 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.

END OF SECTION 02524

SECTION 02577

PAVEMENT MARKINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish and apply pavement markings in accordance with the Commonwealth of Massachusetts Department of Transportation, Standard Specifications for Highways and Bridges, latest edition, hereinafter referred to as the "Standard Specifications." All references to method of measurement, basis of payment, and payment items in the Standard Specifications are hereby deleted. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned therein.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02500 – PAVING AND SURFACING

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Product data and specification submittals.
 - 2. For information purposes only, submit manufacturer's printed installation instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. M7.01.03 White Thermoplastic Reflectorized Pavement Markings.
- B. M7.01.04 Yellow Thermoplastic Reflectorized Pavement Markings.
- C. M7.01.23 Fast Drying White-Borne Traffic Paint.
- D. M7.01.24 Fast Drying Yellow-Borne Traffic Paint.
- E. M7.01.18 Preformed Permanent Plastic Pavement Markings or Legend.
- F. M7.01.07 Glass Beads

PART 3 – EXECUTION

3.1 GENERAL

A. Apply Pavement Markings as follows:

Material	Material Application Temperature Degrees F	Line Thickness Mils	Reflectorized Application
M7.01.03	400-425	125-188	1lb/10 SF Drop On
M7.01.04	400-425	125-188	1lb/10 SF Drop On

- B. The ambient air temperature for Thermoplastic application shall be minimum of 45 degrees F and rising at the time of marking operations. If work has started and air temperatures fall below 45 degrees F [7.2 C] and continuous cooling is indicated, work shall be stopped. In cool weather conditions, temporary drops in temperature down to 40 degrees F [4.4 C] may be tolerated, providing temperatures also vary upwards. Sustained striping (greater than one hour) at 40 degrees F [4.4 C] shall not be allowed. Starting work at air temperatures lower than 45 degrees F [7.2 C] shall not be allowed.
- C. Apply markings at cross walks and stop lines at the locations directed by the Engineer or as shown in the drawings.
- D. Align new markings to match existing in color, dimensions and spacing, and extend new markings where directed.
- E. Marking widths for crosswalks and stop lines shall be 12 inches, and applied within a tolerance of five percent. Deviation of straight strips shall not exceed ½-inch in 50 feet.
- F. Existing pavement markings no longer required shall be completely removed, by grinding method, prior to placement of any temporary lines.
- G. Pavement markings for crosswalks, fog lines, and stop lines shall be white. Pavement markings for centerlines shall be yellow.
- H. All temporary pavement markings and parking lot markings shall be traffic paint. All permanent pavement markings shall be thermoplastic.

3.2 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. Repair damages or other irregularities to satisfaction of Engineer, at no additional cost to the Owner, before final acceptance by the Engineer.

3.3 GUARANTEE

- A. During the one year guarantee period, the Contractor shall maintain the surfacing and shall promptly fill with similar material any depressions and holes that may occur so as to keep the surfacing in a safe and satisfactory condition for traffic.

3.4 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02577

SECTION 02590

BRICK AND CONCRETE BLOCK MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. The work covered under this Section includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with providing brick masonry, as directed, for furnishing and installing masonry plugs, extending frames to grade, masonry walls, manhole invert tables and for all other necessary appurtenant work complete and accepted in accordance with the Drawings and Specifications and as directed.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02252 – PRECAST CONCRETE MANHOLES
- C. Section 02615 – DUCTILE IRON PIPE AND FITTINGS
- E. Section 02604 – CATCH BASINS
- F. Section 02524 – CURBS, WALKS AND DRIVEWAYS
 - 1. Refer to this section for brick sidewalk construction.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS.
 - 1. Submit manufacturer specification sheets for and shop drawings for all masonry items, mortar and appurtenances.

1.4 QUALITY CONTROL

- A. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by frost.
- B. The Contractor shall not construct brick or block masonry in freezing weather or if the bricks or blocks contain frost, except with the Engineer's written permission and subject to the conditions the Engineer requires.

PART 2 - MATERIALS

- 2.1 Bricks: Bricks shall be clay or shale brick and shall conform in all respects to ASTM C32, latest revision, Grade SS. Brick used for extending manhole frames to grade shall be concrete brick conforming to ASTM C139, latest revision.
- 2.2 Concrete Blocks: Concrete blocks shall conform in all respects to ASTM C139, latest revision.
- 2.4 Cement: Cement shall conform to the standard specifications for Portland cement of ASTM C150, latest revision, Type II, unless otherwise directed. Whenever directed by the Owner, a quick-setting cement (Type III) shall be used for any desired purpose at no additional expense to the Owner.
- 2.5 Sand: Sand for mortar shall be graded uniformly from fine to coarse and when dry shall pass a No. 8 sieve. Sand shall consist of aggregate having clean, hard, durable, strong, uncoated grains and free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances. The sand shall be washed clean before loading on delivery trucks. Natural sand which shows a color darker than the standard color when tested in accordance with the Colorimetric Test for Sands as described in ASTM C40, latest revision, will be cause for rejection.
- 2.6 Lime: Lime shall be hydrated lime conforming to ASTM C207, latest revision.
- 2.7 Water: Mixing water for concrete and mortar shall be clean and free from oil, acid, alkali, injurious amounts of vegetable matter and other impurities. Potable water obtained from a municipal supply is preferable.
- 2.8 Mortar: Mortar and mortar plaster shall be composed of one part Type II portland cement, and two parts sand to which a small amount of hydrated lime, not to exceed 10 lbs. to each bag of cement, shall be added. Only a sufficient amount of water shall be added to make a stiff plastic mortar of a consistency and texture satisfactory to the Owner. Retempering of mortar in which the cement has started to set will not be permitted.

PART 3 - EXECUTION:

- 3.1 Brick masonry plugs for pipes and structures shall be 8-inches thick, unless otherwise shown or directed.
- 3.2 Each concrete block shall have a length of no more than 18-inches and a height of no more than 8-inches, unless otherwise shown or directed.
- 3.3 Bricks or concrete blocks that are broken, warped, cracked or of improper size or quality, or otherwise defective shall not be used in the work and shall be removed from the site. Broken or chipped bricks or blocks may be used to shape around irregular openings only if permission is granted by the Engineer.
- 3.4 Use either rectangular block units, or block units curved in shape with the inside and

outside surfaces curved to the required radii. For corners use blocks with a return side not less than $\frac{1}{2}$ the length of the normal block.

- 3.5 When using concrete blocks in the cones, or tops of manholes, or other structure, they may have any shape required to form the structure with inside and outside joints not more than $\frac{3}{8}$ -inches thick. Also, design the block so that only full-length or $\frac{1}{2}$ -length units are required to lay any one course.
- 3.6 Bed joints shall be formed of a thick layer of mortar which shall be smoothed or furrowed slightly. Head joints shall be formed by applying to the brick to be laid a full coat of mortar on the entire end, or on the entire sides as the case requires, and then shoving the mortar-covered end or side of the brick tightly against the bricks laid previously; the practice of buttering at the corners of the brick and then throwing mortar or scrapings into the empty joints will not be permitted. Dry or butt joints will not be permitted. Joints on the inside face of walls shall be tooled slightly concave with an approved jointer when the mortar is thumbprint hard; the mortar shall be compressed with complete contact along the edges so as to seal the surface of the joints.
- 3.7 Do not make joints more than $\frac{1}{2}$ -inch thick and use a uniform thickness throughout the structure. Finish all joints properly as the work progresses and on exposed faces strike them neatly using the "weather" joint, except if a plaster coat is required rake the joint.
- 3.8 All beds on which masonry is to be laid shall be cleaned and wetted properly. Thoroughly wet all bricks or blocks and let the surface dry so they shall be damp, but free of any surface water when placed to prevent slipping on the mortar.
- 3.9 Lay the first course of bricks or blocks on a full bed of mortar. Lay all bricks or blocks in courses with full and close mortar joints. Maintain horizontal courses throughout the structure. Adjoining courses shall break joints by $\frac{1}{2}$ the length of the brick or block, if possible. Make at least one course in every 7, for double-wall construction, all headers. If using brick for making closures, make their length not less than the width of a whole brick and, if possible make closures with whole brick as headers.
- 3.10 Apply a plaster coat of mortar to the interior and exterior surfaces of brick, concrete block, or block masonry, in manholes, inlets, and similar sewer or drain structures. Make this plaster coat with the same mortar used in laying the bricks or blocks and make it not less than $\frac{1}{2}$ -inch thick. Before applying a plaster coat to a brick or block surface, wet them with water and let the surface dry enough to bond to the plaster coat.
- 3.11 Brick masonry for extending frames to grade shall be constructed to the thickness indicated and shall be to the dimensions of the flange of the cast iron frames at top of manholes.
- 3.12 Brick masonry for manhole invert tables shall be one course constructed to the slope shown on the details or as directed.
- 3.13 Masonry walls shall be constructed to the thickness indicated. Other brick and concrete masonry shall be provided to the details and the dimensions specified, indicated or as directed.

- 3.14 Masonry construction shall be done in a manner to insure watertight construction and all leaks in masonry shall be sealed.
- 3.15 Unless the plans or contract provides otherwise, construct concrete footings, not less than 6-inches thick, and that cover the entire area under all brick or concrete block masonry.
- 3.16 Plaster shall be troweled to a smooth hard finish and no backfill shall be placed until the mortar has thoroughly hardened.
- 3.17 All workmanship shall conform to the best standard practice, and all brick and concrete block masonry shall be laid by skilled workmen.

END OF SECTION 02590

SECTION 02604

CATCH BASINS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work covered under this Section includes the furnishing of all plant, labor, equipment, appliances and materials, and performing all operations in connection with installing catch basins at the locations and to the details indicating and/or directed, including pre-cast concrete sections, base, catch basin hood, frame and grate, and inserts/traps.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02252 – PRECAST CONCRETE MANHOLES
- D. Section 02590 – BRICK MASONRY
- E. Section 03300 – CAST-IN-PLACE CONCRETE
- F. Section 03315 – GROUT
- G. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

- A. General: Submit the following in accordance with General Conditions of Contract and Section 01300 – SUBMITTALS:
 - 1. The Contractor shall furnish complete shop drawings for all pre-cast sections; cast iron frames, grates, inserts/traps, and hoods; and other appurtenances. Cast iron frames, grates, inserts/traps, and hoods shall be from a United States manufacturer.
 - 2. Prior to fabrication, submit shop drawings showing details of precast monolithic base sections, risers, flat slab manhole tops, joints and gaskets, construction details, tolerances, and other information as required by the Owner.
 - 3. Submit manufacturer's recommended installation procedures for informational purposes.

PART 2 - PRODUCTS

2.1 CATCH BASINS (SINGLE AND DOUBLE GRATES)

- A. Precast concrete catch basins shall be constructed as detailed, and shall be a minimum of 4-feet in diameter for single grate catchbasins and 5-feet diameter for double grate catchbasins. Catch basins shall be designed for a minimum of H-20 loading. Catch basins shall have a minimum of 4-foot sump depth and conform to ASTM C478-72.
- B. Pre-cast concrete catch basins shall conform to the applicable requirements of Section 02252 - Precast Manholes. Pre-cast concrete single catch basin top slabs shall be a minimum thickness of 8-inches. Wall section shall be a minimum 5-inches thick and the base section shall be a minimum 6-inches thick. Pre-cast concrete double catch basin top slabs shall be a minimum thickness of 8-inches.
- C. Mortar where required shall conform to Section 02590 – BRICK MASONRY.

2.2 FRAMES

- A. Frames to have factory applied coating to prevent corrosion
- B. Single Catch Basin Frames shall be 24-inch square x 8-inch as manufactured by E. L. LeBaron Foundry Co., (product number 62064 600); for three flange, Neenah Foundry Co., Campbell Foundry Co., or equal.
- C. Double Catch Basin Frames shall be 24-inch x 48-inch x 8-inch as manufactured by E. L. LeBaron Foundry Co., (product number 62101 600); with appropriate flange removed to match drawings, Neenah Foundry Co., Campbell Foundry Co., or equal.
- D. Frames shall be manufactured by a United States manufacturer who can demonstrate at least five years of successful experience.

2.3 GRATES

- A. Grates to have factory applied coating to prevent corrosion
- B. Single Catch Basin Grates shall have 2-inch square openings, as manufactured by E. L. LeBaron Foundry Co., (product number QWP 45-600); Neenah Foundry Co., Campbell Foundry Co., or equal unless otherwise shown on the drawings.
- C. Double Catch Basin Grates shall have 2-inch square openings, as manufactured by E. L. LeBaron Foundry Co., (product number QWP 45-600); Neenah Foundry Co., Campbell Foundry Co., or equal unless otherwise shown on the drawings.
- D. Grates shall be manufactured by a United States manufacturer who can demonstrate at least five years of successful experience.

2.4 HOODS

- A. Catch Basin Hoods shall be as manufactured by E. L. LeBaron Foundry Co., model L-202, Neenah Foundry Co., Campbell Foundry Co., or equal.

2.5 INSERTS

- A. Catch basin traps shall be installed in all catch basins in paved areas. Traps shall be cast iron and removable. Traps shall be Neenah Type R-3701, or equal.

PART 3 - EXECUTION

3.1 SETTING PRECAST CATCH BASIN SECTIONS

- A. Catch basins shall be constructed with a pre-cast concrete base placed on a firm compacted subbase as specified and as detailed on the Drawings. Catch basins shall be installed level and plumb, with specified joint sealant and in accordance with the provisions of Section 02252 – Precast Manholes.
- B. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed.
- C. All holes in sections used for handling shall be thoroughly plugged with non-shrink grout.
- D. Cutting or tampering of cast basin structures in the field, for the purpose of creating new openings or modifying existing openings, will not be permitted.

3.2 LAYING BRICKWORK

- A. Only clean bricks shall be used in brickwork for manholes. The brick shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

3.3 SETTING CATCH BASIN FRAMES AND GRATES

- A. Catch Basin frames shall be set with tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings. Frames shall be set concentric with the top of the manhole and in a full bed of mortar so that the space between the top of the brick and mortar and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to a height of 4-inches above the flange.
- B. Grates shall be left in place in the frame on completion of other work at the manholes.

3.4 INSTALLING HOODS

- A. Hoods shall be built into the catch basin wall and shall be watertight.

3.5 CLEANING

- A. All excess material including dirt, loose concrete, bricks, grit, stones and any other

material, shall be removed from all manholes prior to final review by the Engineer.

- B. A final cleaning shall be performed, to include complete removal of all accumulated debris and fluids from each catch basin, upon complete project completion.

END OF SECTION 02604

SECTION 02610

PIPE TESTING AND CLEANING

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment and incidentals required and clean and test all new pipe installed under this Contract and as specified herein.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02622 – POLYVINYL CHLORIDE GRAVITY PIPE
- C. Section 2620 - HIGH DENSITY POLYETHYLENE
- D. Section 2623 - POLYPROPYLENE PIPE

1.3 SUBMITTALS – (Not Used)

1.4 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C828 – Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines.
- B. Where reference is made to the above standard, the revision in effect at the time of bid opening shall apply.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 TESTING (Sanitary Sewers)

- A. Low Pressure Air Test
 - 1. For making low-pressure tests, the Contractor shall use equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low-pressure air. The equipment shall be provided with an air regulator valve of air safety valve so set that the internal air pressure in the pipeline cannot exceed 8psig. The leakage test using low-pressure air shall be made on each manhole-to-manhole section of pipe. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressure without requiring external bracing or blocking. All air used shall pass through a

single control panel.

2. Low-pressure air shall be introduced into sealed line until the internal air pressure reaches 4psig greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe at the time of the test. However, the internal air pressure in the sealed line shall not be allowed to exceed 8psig.
3. At least 2 minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period, the low pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig (greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe) shall not be less than that shown in the tables prepared by the National Clay Pipe Institute.
4. If the pipe section does not pass the air test, either sectionalize the section tested to determine the location of the leak or perform a hydrostatic leak test. Once the leak has been located, repair and retest.

B. Allowable Deflection Test

1. Pipe deflection measured not less than 90 days after the backfill has been completed as specified shall not exceed 5 percent. Deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
2. Deflection shall be measured with a rigid mandrel (Go/No Go) device cylindrical in shape and constructed with a minimum of nine evenly spaced arms or prongs. Drawings of the mandrel with complete dimensions shall be submitted to the Engineer for each diameter of pipe to be tested. The mandrel shall be hand pulled through all sewer lines.
3. Any section of sewer not passing the mandrel shall be uncovered at no additional cost to the Owner and the bedding and the backfill replaced to prevent excessive deflection. Repaired pipe shall be retested at no additional cost to the Owner.

3.2 FIELD TESTING AND ACCEPTANCE

- A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material that may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned out and if the groundwater level is above the pipe or following a heavy rain, the Engineer will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired.

END OF SECTION 02610

SECTION 02615

DUCTILE-IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Furnishing and installing ductile-iron pipe and fittings, as indicated and specified for new or replacement water, sewer, or drain pipe.
- B. Options:
 - 2. For joints in buried exterior pipelines, provide push-on joint. All fittings and valves shall be mechanical joint.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02675 – DISINFECTION OF WATER MAINS
- D. Section 02704 – PIPELINE PRESSURE AND LEAKAGE TESTING

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 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 literature stating that the ductile iron pipe and fittings have been manufactured and tested in accordance with AWWA/ANSI specifications, including ANSI/NSF Standard 372.
 - 3. Submit a detailed description of proposed testing, flushing and disinfection procedures to be used for this project. The description shall contain the name of the person responsible for the testing, flushing and disinfection

work, equipment to be used, chemical to be used, method of measuring flow during flushing procedures and the name of the laboratory to be used for analysis. Review of the description shall not be construed as approval of any methods to be used, the Contractor shall be fully responsible for achieving the specified test results.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. Owner reserves right to inspect and test by independent service at manufacturer's plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.

PART 2 - PRODUCTS

2.1 PIPE

- A. Ductile Iron:
 - 1. Ductile iron pipe shall be that of a United States manufacturer who can demonstrate at least 5 years of successful experience in manufacturing ductile iron pipe. The pipe shall be equipped with push-on joints.
 - 2. All ductile iron pipe shall conform to ANSI A21.50 (1976) (AWWA C150) and ANSI A21.51 (AWWA C151).
 - 3. The ductile iron pipe shall be Class 52 and furnished in nominal 18-foot lengths, with Push-on Joints as manufactured by U.S. Pipe and Foundry Company, Griffin Pipe Co., Clow Corporation, or equal with gaskets conforming to AWWA C111 ANSI A21.11 "Rubber Gasket Joints".
 - 4. The ductile iron pipe shall be double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil. thick. The cement lining shall conform to AWWA C104 ANSI A21.4. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

2.2 FITTINGS

- A. Fittings shall be manufactured in the United States and shall be compact ductile iron Class 350 Mechanical Joint, conforming to ANSI Specification A21.53 (AWWA C153), latest edition, for pipe sizes 16-inches and smaller, and Class 350 standard Mechanical Joint fittings conforming to AWWA C110/ANSI A21.10, latest edition except as specified, for pipe sizes 16 through 24-inches, unless specifically stated otherwise in the specifications or on the drawings. Fittings shall

be suitable for use with restraints as specified hereinafter. Fittings shall be 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.

1. Hydrant tees shall have a rotatable mechanical joint gland on the 6-inch plain end branch to provide positive valve restraint, unless otherwise allowed by the Engineer.
2. Caps and plugs installed in all new work as indicated on the drawings shall be provided with a threaded corporation or bleeder valve so that air and water pressure can be relieved prior to future connection.
3. Solid sleeves shall be ductile iron with 350 psi rating. Sleeves shall conform to ANSI/AWWA C110.

2.3 JOINTS

- A. Provide mechanical joint or push-on joint pipe with necessary accessories, conforming to ANSI A21.11.
 1. Provide gasket composition suitable for exposure to liquid within pipe.
 2. Provide gasket composition suitable for exposure to potable water.
 3. Provide mechanical joint gaskets with copper tips to provide electrical continuity.
 4. Provide serrated brass wedges for push-on joints to provide electrical continuity; two per joint for pipe 12-in. and smaller and four per joint for larger pipe.
- B. Provide pipe flanges and accessories conforming to ANSI A21.15.
 1. Provide flat faced flanges.
 2. Provide 1/8 in. thick, full faced gaskets suitable for exposure to liquid within pipe.
- C. Restrained joints shall be furnished for installation on all fittings, sleeves, hydrants and valves. Restraints for mechanical joints shall be Megalug Series 1100 as manufactured by Ebac Iron Co., Uni-flanged Series 1400 Mechanical Joint Restraint or equal. Restraints for push-on joints shall be Series 1700 as manufactured by Ebac Iron Co., or Series 1390 as manufactured by Uni-Flange.
- D. Restraint systems for push-on pipe utilizing steel-wedge gaskets will be acceptable.

2.4 COUPLINGS AND SLEEVES

- A. Pressure rating at least equal to that of related pipeline with a minimum rating of 150 psi.
- B. Ductile iron coupling with SBR gaskets and fusion bonded epoxy coating. Coupling shall be suited for extended range of pipe materials and diameters. Coupling shall be XR501 as manufactured by Romac Industries, Dresser Style 138 or equal. Transition couplings shall be Dresser Style 162 or equal. Couplings shall be manufactured in the United States.
- C. Couplings to be restrained by stainless steel threaded rods, clamps, bolts, tiebacks, washers, and nuts as directed by Engineer.
- D. Solid sleeves shall be long body type, ductile iron with mechanical joints. All sleeves shall conform to the weights and dimensions shown in the latest edition of Ductile Iron Research Association (DIPRA) "Handbook of Ductile Iron Pipe" and be provided complete with all accessories.

2.5 THRUST RESTRAINT GLANDS

- A. Thrust restrain glands shall be used on all mechanical joint fitting, valves and sleeves. The thrust restrain system shall incorporate individually activated gripping surfaces integral to the follower gland that makes up the mechanical joint.
- B. Glands shall be manufactured of ductile iron conforming to ASTM A536. Gland dimensions shall be such that they can be used with standard mechanical joint bell and tee head bolts that conform to the latest revision of ANSI/AWWA A21.11/C111 and used to insure proper actuating of restraining devices. The mechanical joint restraint shall have a working pressure of at least 150 psi with a minimum safety factor of 2:1.
- C. Gland shall be specifically designed for use with mechanical joint ductile iron pipe, fitting and valves. Glands shall be Series 1100 MEGALUG by EBBA Iron, East Land, Texas or approved equal.

2.6 CONNECTIONS - TAPPED

- A. Provide watertight joint with adequate strength against pullout. Use only tapered thread taps.
- B. Maximum size of taps in pipe or fittings without bosses not to exceed that listed in appropriate table of Appendix to ANSI A21.51 based on:
 - 1. 2 full threads for ductile iron.
- C. Where size of connection exceeds that given above for pipe, provide boss on pipe barrel or use tapping saddle. Make tap in flat part of intersection of run and

branch of tee or cross, or connect by means of tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, as indicated or permitted.

2.7 STANDARD LINING AND COATING

- A. Inside of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to ANSI A21.4.
- B. Outside of pipe and fittings within structures: Clean and apply one shop coat of Koppers Pug Primer made by Koppers Co., Inc., Pittsburgh, PA; Chem-Prime 37-77 made by Tnemec Co., North Kansas City, MD; 13-R-50 Chromax Primer made by Valspar Corp. Short Hills, NJ; or acceptable equivalent.

2.8 GASKETS, BOLTS, AND NUTS

- A. Provide ring rubber gaskets with cloth insertion for flanged joints, neoprene faced phenolic for insulating gaskets.
 - 1. Gaskets 12 in. in diameter and smaller, 1/16 in. thick.
 - 2. Larger than 12 in., 1/8 in. thick.
- B. Make flanged joints with:
 - 1. Bolts.
 - 2. Bolt studs with nut on each end.
 - 3. Studs with nuts where flange is tapped.
 - 4. Plastic bolt sleeves and washers for insulating joints.
- C. Number and size of bolts conform to same ANS as flanges.
- D. Provide bolts and nuts, except as specified or indicated, Grade B, ASTM A307.
- E. Provide bolt studs and studs of same quality as machine bolts.
- F. Flanged joints for wall castings flush with masonry made up with Type 316 stainless steel stud bolts and nuts.
- G. Submerged flanged joints made up with Type 316 stainless steel bolts and nuts.

2.9 POLYETHYLENE PIPE ENCASEMENT

- A. Material: Virgin polyethylene conforming to ANSI/ASTM D1248.
- B. Thickness: Minimum nominal thickness of 8 mils.

- C. Material and installation methods to conform to requirements of AWWA C105.

2.10 INSULATION

- A. Insulation shall be manufactured by Thermal Pipe Systems, Braintree, Massachusetts, Atlas Insulation, Ayer, Massachusetts or Insulated Piping Systems, Inc., Canton, Massachusetts, or equal. Insulation shall be factory formed-in-place polyurethane foam insulation having nominal thickness of 3", with an in-place density of 2.5 pcf, and a "K" factor of 0.14 BUT/in./hr/deg./F/sq. ft. Straight joints between insulated pipe lengths, and the end section of non-insulated pipe shall be 20-gauge corrugated aluminum performed to be fastened with stainless steel screws and bands. Jackets shall have expansion joints at 25-foot intervals. Sections of jacket shall have 2-inch minimum at all seams.
- A. Jacket shall have one layer of one (1) mil polyethylene film with a protective coat of 40-lb. virgin draft paper to act as a moisture and galvanic corrosion barrier.

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 especially shall be kept 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 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 ALIGNMENT AND PLACEMENT OF PIPE

- A. Jointing of ductile iron pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The last 8-inches of the outside of the spigot end of pipe and the inside of the bell end of pipe shall be thoroughly cleaned. 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.

- B. Installation and jointing of push-on ductile iron pipe shall be in accordance with AWWA C600 Sections 9b and 9c, latest revision, as applicable.
- C. Mechanical joints shall be installed with Mega-Lug or Uni-Flange restraints. Restraints shall be installed in full accordance with the manufacturers instructions. All bolt heads on Mega-Lugs or Uni-Flanges shall be tightened sufficiently so that they shear off to provide indication that proper tightening torque was achieved.
- D. Fittings and valves shall be restrained for the minimum lengths listed on the following table:

MINIMUM RESTRAINED LENGTHS

<u>FITTING</u>	<u>RESTRAINT LENGTH</u>
12" – 45° Bend	13-feet in each Direction
8" – 45° Bend	9-feet in each Direction
6" - 45° Bend	7-feet in each Direction
12" – 22-1/2° Bend	6-feet in each Direction
10" - 45° Bend	11-feet in each Direction
8" - 90° Bend	23-feet in each Direction
8" – 22-1/2° Bend	4-feet in each Direction
8" – 11-1/4° Bend	2-feet in each Direction
6" – 22-1/2° Bend	3-feet in each Direction
6" – 11-1/4° Bend	2-feet in each Direction
12" – 11-1/4° Bend	3-feet in each Direction
12" Vertical Offset	
Upper 45° Bend	27-feet in each Direction
Lower 45° Bend	12-feet in each Direction
8" Vertical Offset	
Upper 45° Bend	19-feet in each Direction
Lower 45° Bend	8-feet in each Direction
6" Vertical Offset	
Upper 45° Bend	14-feet in each Direction
Lower 45° Bend	6-feet in each Direction
12" x 12" x 12" Tee	42-feet in Branch
12" x 12" x 10" Tee	29-feet in Branch
12" x 12" x 8" Tee	16-feet in Branch
12" x 12" x 6" Tee	1-foot in Branch
8" x 8" x 8" Tee	25-feet in Branch
8" x 8" x 6" Tee	10-feet in Branch
8" x 8" x 4" Tee	1-foot in Branch
6" x 6" x 6" Tee	15-feet in Branch
6" x 6" x 4" Tee	1-foot in Branch
16" x 12" Reducer	32-feet Larger Direction only
12" x 10" Reducer	28-feet Larger Direction only
12" x 8" Reducer	31-feet Larger Direction only

12" x 6" Reducer	42-feet Larger Direction only
8" x 6" Reducer	17-feet Larger Direction only
8" x 4" Reducer	29-feet Larger Direction only
6" x 4" Reducer	16-feet Larger Direction only
12" Valve or Dead-end	58-feet in each Direction
10" Valve or Dead-end	49-feet in each Direction
8" Valve or Dead-end	41-feet in each Direction
6" Valve or Dead end	31-feet in each Direction
4" Valve or Dead-end	22-feet in each Direction
2" Valve or Dead-end	18-feet in each Direction

Lengths shown are based on 150 psi test pressure, 4-1/2-foot bury, soil type GP, trench Type 3, and 2:1 safety factor. Changes in conditions will require revision in lengths.

- E. Restrained push on joints shall be installed with specified joint restraints. Restraints shall be installed in full accordance with the manufacturers instructions.
- F. Ductile iron pipe installed near cathodically protected gas lines or within areas subject to corrosive soils or waters shall be fully encased with polyethylene material.
- G. Insulated pipe with jacket is to be installed where shown on the drawings and on any pipe having less than 4-foot cover.
- H. Solid sleeves shall be used to join plain ends on ductile iron pipe. Mechanical joints shall be installed with Mega-Lug, Uni-flange, or MJR restraints, as specified hereinbefore.

3.3 INSTALLATION

A. Piping Support:

- 1. Furnish and install supports to hold piping at lines and grades indicated or specified.
- 2. Support pipe and appurtenances connected to equipment to prevent any strain imposed on equipment.

B. Pipe and Fittings:

- 1. Remove and replace defective pieces.
- 2. Clear of all debris and dirt before installing and keep clean until accepted.
- 3. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.

4. Provide firm bearing along entire length of buried pipelines.
- C. Temporary Plugs: When pipe laying not in progress, close open ends of pipe with temporary watertight plugs. If water in trench, do not remove plug until danger of water entering pipe passed.
- E. Appurtenances: Set valves, fittings and appurtenances as indicated.

3.4 JOINTS AND COUPLINGS

A. Push-on Joints:

1. Insert gasket into groove bell. Apply thin film of nontoxic gasket lubricant over inner surface of gasket in contact with spigot end.
2. Insert chamfered end into gasket. Force pipe past it until it seats against socket bottom.
3. Where required, install restraint and secure push-on joint restraint in accordance with manufacturer's instructions.

B. Mechanical Joints:

1. Wire brush surfaces in contact with gasket and clean gasket.
2. Lubricate gasket, bell, and spigot with soapy water.
3. Slip gland and gasket over spigot, and insert spigot into bell until seated.
4. Seat gasket and press gland firmly against gasket.
5. After bolts inserted and nuts made finger-tight, tighten diametrically opposite nuts progressively and uniformly around joint by torque wrench. Torque bolts to values specified above.

C. Sleeve-Type Coupling:

1. Clean pipe ends for distance of 8 in.
2. Use soapy water as gasket lubricant.
3. Slip follower and gasket over each pipe to a distance of 6 in. from end and place middle ring on pipe end until centered over joint.
4. Insert other pipe end into middle ring and bring to proper position in relation to pipe laid.
5. Press gaskets and followers into middle ring flares.

6. After bolts inserted and nuts made fingertight, tighten diametrically opposite nuts by use of torque wrench of size and torque specified below:

3.5 TESTING

- A. Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.
- B. Pressure and Leakage Tests. Refer to Section 02704 for requirements.

3.6 DISINFECTING AND FLUSHING

- A. Disinfect potable water lines using procedures and materials conforming to AWWA C651.
- B. Refer to Section 02675 for additional requirements.

3.7 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02615

SECTION 02620

HIGH DENSITY POLYETHYLENE PIPE

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 includes the following:
 - 1. Providing and testing of pipe, pipe fittings and specials, jointing materials, and accessories, of various sizes, classes, joints and types, and appurtenant work, at the locations and to the lines and grades as indicated and/or as directed, complete in place, in accordance with the drawings and specifications.
 - 2. The pipe specified under this section shall include all gravity pipes.
- B. Related sections include the following:
 - 1. Section 02210 - Earth Excavation, Backfill, Fill and Grading

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Submit shop drawings or descriptive literature, or both, showing pipe dimensions, joints, joint gaskets, and other details for each size of pipe to be furnished for the project. All pipe furnished shall be manufactured only in accordance with the specifications and the drawings.

PART 2 - PRODUCTS

2.1 PIPE RAW MATERIAL REQUIREMENTS

- A. The resin compound shall be qualified to meet the following:
 - i. The pipe shall be made from a polyethylene resin compound with a minimum cell classification of 345464C as defined in ASTM D3350.

- ii. The pipe shall be made from materials meeting the designation of PE3408 as assigned by the Plastics Pipe Institute.
- B. The polyethylene raw material shall contain a minimum of 2%, well dispersed finely divided carbon black for UV stabilization. Additives which can be conclusively proven not to be detrimental to the pipe may also be used provided that the pipe produced meets or exceeds all of the requirements of this specification.
- C. The pipe shall contain no recycled compound except that generated in the manufacturers' own plant, known as re-grind.
- D. The pipe manufacturers Quality System shall be certified as meeting the requirements of an ISO 9001:2000 Quality management system, by a qualified independent body.
- E. Written certification to indicate compliance with the requirements of Section 2.1 of this specification shall be provided by the pipe supplier.
- F. The pipe material shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and pH values between 2 and 13.

2.2 PIPE MANUFACTURING REQUIREMENTS

A. PROFILE WALL PIPE

- i. The pipe and pipe fittings shall be manufactured with dimensions and tolerances in accordance with the manufacturer's internal manufacturing standard. The pipe must meet the requirements of ASTM F894 when the pipe is marked as such. The nominal inside diameter of the pipe shall be true to the specified pipe size. The pipe shall be manufactured by the continuous winding of a closed profile onto suitably sized mandrels. It shall be produced to constant internal diameters.
- ii. Lengths of pipe shall be manufactured with a 30° plated end cut on the termination of the helically wound profile that forms the pipe.
- iii. The pipe shall have a minimum Ring Stiffness Class of 160 Lb./Ft as defined in ASTM F894.
- iv. The pipe shall be manufactured in such a manner that the pipe is available in lengths from 3-60 feet. A variety of lengths are available to accommodate installation, storage or varying ground conditions. Unless otherwise stated, the standard laying length shall be 50 feet (15 meters). Each standard and random length of pipe in compliance with ASTM F894 shall be clearly marked as such as required by the standard.

- v. The pipe shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

B.. SOLID WALL PIPE

- i. The pipe shall be designated in accordance with the relationships of the ISO modified formula as stated in ASTM F714.
- ii. The design pressure rating shall be derived using an HDS of 800 psi at 23°C (73.4°F) resulting in the following maximum continuous Working Pressure Rating (WPR) for the respective pipe classes:

DR32.5	DR26	DR21	DR17	DR15.5	DR13.5	DR11	DR9	DR7.3	DR6.3
50	64	80	100	110	128	160	200	254	300

- iii. Pipe liner shall be a Dimension Ratio (DR) of 32.5. The installed pipe shall have a smooth non-corrugated interior and exterior surface. The supplier shall furnish a manufacturer's certification stating that the material in the pipe meets the requirements of ASTM D 3350-02 with a cell classification of PE 345464 C with the physical properties indicated above. The supplier shall certify the dimensions meet the requirements of ASTM F 714.
- iv. Overpressure limits for pipe qualified as PE3408 shall be allowed a specific magnitude greater than the maximum continuous working pressure of the pipe. Simple guidelines for frequent and infrequent surge conditions are as follows:
 - a. Frequent surge pressures shall be permitted where the magnitude of the total pressure is not greater than 150% of the maximum allowable continuous working pressure of the pipe. Frequent surge pressures are typically generated by normal pump flow changes and valve operations.
 - b. Infrequent surge pressures shall be permitted where the magnitude of the total pressure is not greater than 200% of the maximum allowable continuous working pressure of the pipe. Infrequent surge pressures are described as pump power-out shut down or quick emergency valve closures.

C. PIPE JOINTS

- i. Pipe shall be capable of being joined into a continuous length. The joints shall not create an increase in the outside diameter of the liner pipe to

eliminate any coupling difficulties.

- ii. Acceptable joining methods include field welding, manufactured threaded ends, or locking joints (Snaptite® or equal).
- iii. The locking joints must be water-tight with gaskets that are capable of handling pressures up to 25 feet of head per ASTM D-3212. Each HDPE shall have a male and a female end.
- iv. Pipe joints shall comply with ASTM D-3212 Standard Specification for Joint tightness.

2.3 INSPECTION, TESTS, AND ACCEPTANCE

- A. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the above-mentioned ASTM Specifications. In addition, the pipe shall be subject to thorough inspection and tests, as deemed necessary by the Engineer.
- B. All tests shall be made in accordance with the methods prescribed by the above mentioned ASTM Specifications, and the acceptance or rejection shall be based on the test results.
- C. The Contractor shall furnish all labor to assist the Engineer in inspecting the pipe. Pipe will be inspected upon delivery, and such as does not conform to the requirements of this contract shall be rejected and shall immediately be removed from the project site by the Contractor.

PART 3 - EXECUTION

3.1 HANDLING PIPE

- A. All pipe shall be stored at the site until installation in a manner which will keep the pipe at ambient outdoor temperatures. Temporary shading shall be provided as required to meet this requirement. Simply covering the pipe which allows temperature build-up when exposed to direct sunlight will not be permitted.
- B. Care shall be taken to avoid damaging the pipe and fittings. Pipe outer surfaces shall not be cut, scratched, or gouged to a depth greater than 10% of the pipe minimum wall thickness.

3.2 INSTALLATION

- A. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends

of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

- B. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone and sand shall be as specified in Section 02210.
- C. Suitable bell holes shall be provided, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material. Special care shall be taken to hold the trench width at the crown of the pipe to the maximum width indicated in the Trench Detail on the Contract Drawings.
- D. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
- E. Pipe and fittings shall be installed to the lines and grades indicated on the Drawings. Care shall be taken to ensure true alignments and gradients.
- F. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
- G. After each pipe has been properly bedded, enough bedding material shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes, provided for jointing, shall be filled with bedding material and compacted, and then bedding material shall be placed and compacted to complete the pipe bedding.
- H. The Contractor shall take all precautions to prevent flotation of the pipe in the trench.
- I. At all times pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.
- J. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe.
- K. JOINING AND CONNECTING

Connections to manholes to incorporate manhole adaptor sleeve in addition to boot or gasket. Joints between profile cut 'end treatments' on pipes and fittings shall be made in the field, by the pipe manufacturer's 'joining technicians' using appropriate extrusion welding procedures. Each individual performing welding

must be acknowledged by the Manufacturer as having the necessary skills to undertake the work.

- i. Surface Preparation Areas to be joined shall be clean and dry. The pipe ends to be welded must have a 60° - 90° ☐ 45° on bevel (30° abutting faces) with a depth that is a minimum of 2 times the thickness of the pipe wall that is being welded. The weld bevel may be produced at the factory on pipes that have been supplied with a profile cut end. When a pipe is cut to length on site, the weld bevel preparation shall be part of the preparation for welding. The weld bevel may be produced using a router or by grinding. All surfaces that will receive extrusion weld material shall be abraded using a hand scraper or grinder to remove surface oxidation that may have occurred subsequent to the weld bevel preparation.
- ii. Welding Methods One of the following four methods shall be used for joining pipes.

‘Manual’ ID or OD weld only .. for direct burial of gravity flow pipe;

‘Manual’ OD and ID weld .. for direct burial of pipe subject to long term positive head, or when the pipe will be subject to significant axial tensile installation forces.

- a. Manual Extrusion Welding on ID or OD:

External band clamps may be used to assist with pipe alignment. (ID weld only) The external clamp shall be placed by the contractor under the direction of the manufacturer’s joining technicians. Temporary internal braces or jacks may also be used to assist with pipe wall alignment. Pipe ends shall be positioned to align the notches and to provide the maximum amount of surface contact between adjacent pipe faces while minimizing or eliminating the space between pipe ends. Welding is completed by manufacturer’s joining technicians using the manual extrusion welding procedure recommended by the pipe manufacturer on the inside or outside bevel that follows the profile winding and crosses the 30 ☐ closure at the termination of the profile winding.

- b. Manual Extrusion Welding on ID and OD. External band clamps may be used to assist with pipe alignment. The external clamp shall be placed by the contractor under the direction of the manufacturer’s joining technicians. Temporary internal braces or jacks may also be used to assist with pipe wall alignment. Pipe ends shall be positioned to align the notches and to provide the maximum amount of surface contact between

adjacent pipe faces while minimizing or eliminating the space between pipe ends. Welding is completed using the manual extrusion welding procedure recommended by the pipe manufacturer on the wall of the pipe profile. Typically (but not necessarily) the internal weld will be completed first. The external alignment band clamp will be removed and the external weld will be completed. It will be necessary to provide access to the weld 'work area' by removing temporarily the material under the joint. Bedding materials must be replaced and compacted in accordance with the contract requirements.

- L. Contractor shall conduct receiving inspection of the pipe and fittings and any shipping damage shall be reported to the Manufacturer immediately. Installation of the pipe is to be completed in accordance with these specifications and ASTM D2321.
- M. Through all steps of construction, all necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.
- N. When handling the pipe with slings, use wide fabric choker slings capable of safely carrying the load. They shall be inspected before use. Use such slings for lifting, moving, and lowering pipe and fittings. When lifting the pipe, two (2) lift points are required. This may be accomplished by using an inverted 'Y' or a spreader bar to separate the fabric slings. Wire rope and chains are prohibited.
- O. Trench excavations shall conform to the plans and drawings, as authorized by the Project Engineer and in accordance with all applicable codes. All necessary precautions shall be taken to ensure a safe working environment.
- P. Pipe shall be laid on a stable foundation that provides continuous support to the pipe. Unstable trench bottom soils shall be removed and a 6" bedding of Class 'IB' or better material as defined in ASTM D2321, shall be placed as a bedding base (foundation). Excess groundwater shall be removed from the trench before laying the bedding and pipe. A trench cut in rock or stony soil shall be excavated to 6 " below pipe bottom grade, and brought back to grade with Class 'IB' or better material. All protrusions, boulders and large stones shall be removed. The bedding shall be graded to the required slope before placing the pipe in the trench. Where bedding must be removed for pipe joint alignment and joining purposes, the bedding shall be replaced and compacted in accordance with the contract requirements.
- Q. Pipe placement and Alignment: Pipe is to be placed by the contractor to grade and the ends aligned as described in section 5.3.
- R. Primary Backfill: Primary Backfill material soil type and particle size shall be Class 'IA' to Class 'IV-B' as described in ASTM D2321 and as limited by Table

2 in that standard, or as described in the contract documents. The primary backfill shall be placed and compacted in 6" – 12" lifts to at least 85% Standard Proctor Density or to such other higher density as required by the project engineers to enable the design soil stiffness value to be obtained. The primary backfill shall extend to at least 6" above the pipe crown. During backfilling and compacting, care shall be taken to ensure the haunch areas below the spring-line are completely free of voids.

- S. Final Backfill: Final backfill shall be placed and compacted to finished grade as required by the contract documents. Native soil may be used provided the soil is free of debris, stones, boulders, clumps, etc larger than 3" in their largest dimension up to a height of 24" above the top of the pipe.

3.3 CLEANING

- A. Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing pipe.

3.4 TESTING

- A. Leak Testing: Installed sections of PE Profile Wall pipe shall be examined for leaks by ex-filtration where the ground water is below the pipe obvert, or by infiltration where the ground water is above the pipe obvert.
- B. In-filtration Testing: The ground water table around the pipe must be at least 1 foot above the highest elevation of the pipe obvert for the section being examined. When the pipe is sufficiently large, the joints may be examined visually for leaks. For smaller pipe use CCTV inspection equipment. **No leaks should be observed.** If a leak is observed, it will be necessary to lower the water table below the area of the leak, and to completely dry and clean the area prior to undertaking a repair weld.
- C. Ex-filtration Testing: The ground water table around the pipe must be less than 1 foot above the highest elevation of the pipe obvert of the section being examined. Fill the pipe section to three (3) feet above the highest pipe obvert. Allow to stand for a minimum of 12 hours. *(The profile wall PE pipe will 'relax' due to the imposed internal pressure by minor deflection of the inside surface of the profile wall, increasing the volume inside the pipe.)* Add additional water as required to return the height of standing water to three (3) feet. Let stand for 1 hour and measure the amount of water required to return the standing head to three (3) feet. Repeat three (3) times. The volume of 'make-up' water required in each subsequent step should be less than the preceding step. The values of 'make-up' water over time should trend to a value less than 25 USG per inch diameter per mile of pipe per day.

3.5 TEST FAILURE

- A. If the section of pipe fails to pass the leakage and pressure test, or if there is any visible leakage, the Contractor shall locate, uncover and repair or replace the defective pipe fitting or joint and retest all at his own expense. Pipe will be considered passing only when the leakage does not exceed the above standard. Passing the test does not absolve the Contractor from his responsibility if leaks develop later within the period of warranty.

3.6 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02620

SECTION 02622

POLYVINYL CHLORIDE GRAVITY PIPE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Providing and testing of pipe, pipe fittings and specials, jointing materials, and accessories, of various sizes, classes, joints and types, and appurtenant work, at the locations and to the lines and grades as indicated and/or as directed, complete in place, in accordance with the drawings and specifications.
 - 2. The pipe specified under this section shall include all gravity pipes for new or replacement sewer and drain pipe.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02252 – PRECAST CONCRETE MANHOLES

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Submit shop drawings or descriptive literature, or both, showing pipe dimensions, joints, joint gaskets, and other details for each size of pipe to be furnished for the project within two weeks of Notice to Proceed. All pipe furnished shall be manufactured only in accordance with the specifications and the drawings.

PART 2 - PRODUCTS

2.1 PIPE FITTINGS AND SPECIALS

- A. The polyvinyl chloride pipe and fittings, including those required for stubs, shall conform to ASTM Standard Specifications for Type PSM PVC Sewer Pipe and Fittings, Designation ASTM D3034, latest revision, for sizes 4"-15". Main line pipe (sizes 8" to 24") shall have pipe diameter to wall thickness ratio SDR-35. Service laterals and service pipe (sizes 6" to 8") shall have pipe diameter to wall thickness ratio of SDR-35. The pipe shall be tested by the flat plate deflection method at a minimum of 45 psi at 5 percent deflection in accordance with ASTM D 2412. Standard laying lengths shall be either 14 feet or 20 feet. Fittings shall be compatible with SDR-26 pipe, SDR-35 pipe, or both pipes as required where service pipes connect to main line.

2.2 JOINTS

- A. Joints for the polyvinyl chloride pipe shall be push-on bell and spigot joints using elastomeric ring gaskets. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, as well as petroleum products (oil, gasoline, etc.) and groundwater, and which will endure permanently under the conditions of the proposed use. The joints shall conform to ASTM Standard Specifications for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals, Designation D3212. Gaskets shall conform to ASTM F477.

2.3 INSPECTION, TESTS, AND ACCEPTANCE

- A. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the above-mentioned ASTM Specifications. In addition, the pipe shall be subject to thorough inspection and tests, as deemed necessary by the Engineer.
- B. All tests shall be made in accordance with the methods prescribed by the above mentioned ASTM Specifications, and the acceptance or rejection shall be based on the test results.
- C. The Contractor shall furnish all labor to assist the Engineer in inspecting the pipe. Pipe will be inspected upon delivery, and such as does not conform to the requirements of this contract shall be rejected and shall immediately be removed from the project site by the Contractor.

PART 3 - EXECUTION

3.1 HANDLING PIPE

- A. All pipe shall be stored at the site until installation in a manner which will keep the pipe at ambient outdoor temperatures. Temporary shading shall be provided as required to meet this requirement. Simply covering the pipe which allows temperature build-up when exposed to direct sunlight will not be permitted.
- B. Care shall be taken to avoid damaging the pipe and fittings.

3.2 INSTALLATION

- A. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit. Installation shall conform to ASTM D 2321.

- B. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone and sand shall be as specified in Section 02210.
- C. Suitable bell holes shall be provided, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material. Special care shall be taken to hold the trench width at the crown of the pipe to the maximum width indicated in the Trench Detail on the Contract Drawings.
- D. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
- E. Pipe and fittings shall be installed to the lines and grades indicated on the Drawings. Care shall be taken to ensure true alignments and gradients.
- F. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
- G. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
- H. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.
- I. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.
- J. Details of gasket installation and joint assembly shall follow the directions of the manufacturers of the joint materials and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.
- K. All premolded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory, as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.
- L. Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers

secured in place in an acceptable manner.

- M. After each pipe has been properly bedded, enough bedding material shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes, provided for jointing, shall be filled with bedding material and compacted, and then bedding material shall be placed and compacted to complete the pipe bedding.
- N. The Contractor shall take all precautions to prevent flotation of the pipe in the trench.
- O. At all times pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.
- P. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe.
- Q. Pipelines shall not be used as conductors for trench drainage during construction.
- R. During backfilling operations, a brightly colored polyethylene tape manufactured specifically for warning and identification of buried utility lines shall be buried 2 feet below the ground surface along the entire length of the pipe from the pumping station to the point of discharge. Tape shall be provided in rolls, 6-inches minimum width, color coded for intended service with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be "CAUTION BURIED SEWAGE PIPE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained the trench backfill material.

3.3 ALLOWABLE PIPE DEFLECTION

- A. Pipe provided under this Specification shall be so installed as to not exceed a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
- B. Upon completion of a section of pipe, including placement and compaction of backfill, the Contractor shall measure the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer, and be reviewed by the Engineer. The section of pipe must be placed and backfilled for a minimum of 90 days before the deflection can be measured.
- C. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem without additional compensation.

3.4 CLEANING

- A. Care shall be taken to prevent earth, water and other materials from entering the

pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing pipe.

3.5 TESTING OF PIPE

- A. If the visual inspection of the completed pipe or any part thereof shows any pipe, manhole or joint which allows infiltration of water in a noticeable stream or jet, the defective work or material shall be replaced or repaired as directed.
- B. After completing installation and backfill of pipe, the Contractor shall, at his expense, conduct a line acceptance test using low pressure air.
- C. Equipment used shall meet the following minimum requirements.
- D. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
- E. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
- F. All air used shall pass through a single control panel.
- G. Three individual hoses shall be used for the following connections.
 - 1. From control panel to pneumatic plugs for inflation.
 - 2. From control panel to sealed line for introducing the low pressure air.
 - 3. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
- H. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to the manufacturer's recommended inflation pressure. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
- I. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.
- J. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back

pressure of any groundwater that may be over the pipe) is not less than the time shown for the given diameter in the following table.

Pipe Diameter	Time
<u>Inches</u>	<u>Minutes</u>
4	2.0
6	3.0
8	4.0
10	5.0
12	6.0

- K. In areas where groundwater is known to exist, the Contractor shall install a 1/2-inch diameter capped pipe nipple, approximately 10-inches long, through the manhole wall adjacent to one of the sewer lines entering the manhole. This shall be done at the time the line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same). In no case shall the starting pressure exceed 9.0 psig.

3.6 TEST FAILURE

- A. If the section of pipe fails to pass the leakage and pressure test, or if there is any visible leakage, the Contractor shall locate, uncover and repair or replace the defective pipe fitting or joint and retest all at his own expense. Pipe will be considered passing only when the leakage does not exceed the above standard. Passing the test does not absolve the Contractor from his responsibility if leaks develop later within the period of warranty.

3.7 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01650 – CONTRACT CLOSEOUT.

END OF SECTION 02622

SECTION 02623

POLYPROPYLENE PIPE

PART 1 — GENERAL

1.1 SUMMARY

- A. This section includes non-pressure gravity-flow sanitary sewer outside the building, with the following components:
- B. Sanitary sewerage piping and accessories

PART 2 — RELATED WORK

- A. SECTION 01300 - SUBMITTAL PROCEDURES
- B. SECTION 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

2.1 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO HB Section 17 – Soil-Thermoplastic Pipe Interaction system
 - 2. AASHTO HB Section 30 – Thermoplastic Pipe
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C969 – Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
 - 2. ASTM C1103/C1103M – Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Line
 - 3. ASTM D2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - 4. ASTM D2729 – Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - 5. ASTM D3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
 - 6. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
 - 7. ASTM F2487 – Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines
 - 8. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 - 9. ASTM F1417 – Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
 - 10. ASTM F2736 – 6 to 30 in. [152 to 762 mm] Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
 - 11. ASTM F2764 – 30 to 60 in. [750 to 1500 mm] Polypropylene (PP) Triple Wall Pipe and Fittings for non-pressure Sanitary Sewer Applications

2.2 DEFINITIONS

- 1. PP: Polypropylene Pipe

2. Piping System: All products associated with the drainage system including but not limited to pipe, fittings, drainage structures, geotextile, best management practice products and storage systems.

2.3 PERFORMANCE REQUIREMENTS

- A. Water Tight Gravity-Flow, Non-pressure, Sanitary Sewer Piping shall pass a 10.8 psi (74 kPa), gage, laboratory pressure test for 10-minutes with no visible leaks at the joint or pipe wall. Pipe shall also pass a 22-inches Hg (74 kPa) vacuum test for 10 minutes where the internal pressure shall not change more than 1-inch Hg (3 kPa). Piping shall pass the same tests as above but with an axial joint misalignment of not less than 1 degree.

2.4 SUBMITTALS

- A. The following shall be submitted by contractor in accordance with Section 01 33 00 Submittal Procedures:
 1. Product Data for the following:
 2. Pipe and Fittings
 3. Product specifications
 4. Installation procedures
 5. Manholes
 6. Product specifications
 7. Installation procedures
 8. Miscellaneous Accessories
 9. Product specifications
 10. Installation procedures
 11. Independent third party certification or test report demonstrating conformance to applicable pipe specifications, before pipe is installed, for the following:
 12. All Pipe material
 13. Material Performance
 14. Joint Performance
 15. Certification of adherence to applicable standard
 16. Products submitted as approved equal must be submitted at least 2 weeks prior to project bid opening and must be approved by project engineer. Submittal for approved equal product must contain a signed letter from an executive officer of the manufacturer stating product is equivalent to all applicable requirements of this specification and shall include all items listed in section 1.6 B of this specification.

2.5 DELIVERY, STORAGE AND HANDLING

- A. All pipe and fittings shall be delivered to the site and unloaded with handling that conforms to the manufacturer's instructions for reasonable care. Pipe shall not be rolled or dragged over gravel or rock during handling. The Contractor shall take necessary precautions to ensure the method used in lifting or placing the pipe does not induce stress fatigue in the pipe.

PART 3 - PRODUCTS

3.1 CORRUGATED POLYPROPYLENE (PP) PIPE

CITY OF SALEM

POLYPROPYLENE PIPE

WASHINGTON ST. & DODGE ST.

02623-2

- A. Twelve- through 60-inch (300 through 1500-mm) pipe shall be watertight and shall be triple walled ADS SaniTite™ HP or pre-approved equal. Pipe shall be designed for 30-foot bury depth with sanitary grade, water tight fittings. The pipe supplied shall be watertight as defined in the joint performance requirements of this specification. Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions, and markings found in ASTM F2736 for 12 through 30-inch dual wall pipe diameters and ASTM F2764 for 30 through 60-inch triple wall pipe diameters.
- B. Virgin material for 12 through 60-inch pipe and fitting production shall meet be an impact modified copolymer meeting the material requirements of ASTM F2736 and ASTM F2764, for the respective pipe diameter.
- C. Minimum pipe stiffness shall be 46pii (pounds per inch diameter per inch length) when tested in accordance with ASTM D2412 with exceptions as noted in ASTM F2736 or ASTM F2764, for applicable diameters.

3.2 JOINT PERFORMANCE

- A. Watertight joints shall meet the ASTM D3212 10.8 psi (74kPa) laboratory test. Spigot shall have two gaskets meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly. Twelve through 60-inch (300 to 1500-mm) diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer.
- B. Cold joint connections between corrugated or smooth wall pipes to concrete structures shall be A-LOK Premium compression gaskets or approved equal.
- C. Joint seals between PP pipe connections to existing pipe with waterstops and concrete encasement shall be Mar Mac Polyseal Pipe Coupler or approved equal.

3.3 FITTINGS

- A. Fittings shall conform to ASTM F2736 or F2764, for applicable diameters, and be capable of withstanding all operating conditions when installed. Fittings may be molded or fabricated. Fabricated fittings shall be welded at all accessible interior and exterior junctions.
- B. Repair couplers may be utilized to connect field-cut pipe. Repair couplers shall be capable of passing testing requirements stated in Section 3.4.10.1.
- C. Connections between ribbed/corrugated profile pipe and/or transitions from smooth wall plastic drainage pipe to ribbed corrugated profile pipe shall be Flex-Seal Corrugated Transition Couplings or approved equal.
- D. Connections between ribbed/corrugated profile pipes to cored or cast holes in manhole walls shall be PSX: Direct Drive Pipe-to-Manhole Connectors or approved equal.

- E. Flexible pipe-to-manhole connectors shall be A-LOK Premium Flexible Connectors or approved equal.
- F. Fiberglass field sleeves shall be A-LOK Field Sleeves or approved equal.

3.4 INSTALLATION

- A. Pipe installation shall be in accordance with Section 3 of this specification and the product manufacturer's published installation guides.

PART 4 — EXECUTION

4.1 EARTHWORK

- A. Excavation, trenching, and backfilling shall be as specified in Division 2 Section "Earthwork."

4.1 IDENTIFICATION

- A. For all Sanitary Sewer pipe, install green warning tape directly over pipe and at outside edges of underground structures.
 - 1. Detectable warning tape shall be installed over nonferrous piping and over edges of underground structures.

4.2 PIPE INSPECTION

- A. Piping, fittings, and structures shall be inspected prior to installation and any defective or damaged product shall be replaced.
- B. Corrugated PP Pipe and Fittings
- C. Any pipe, fittings, or structures with cuts, punctures, or other damage on the interior or exterior shall be rejected and replaced.
- D. Any pipe, fittings or drainage structures with damaged ends or joints, which would prevent proper sealing of the joints, shall be rejected and replaced.

4.3 PIPING, FITTINGS, AND DRAINAGE STRUCTURE INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping system. Location and arrangement of piping layout take design considerations into account. Install piping system as indicated herein and as directed by the product manufacturer, to extent practical. Where specific installation procedure is not indicated, follow product manufacturer's written instructions.
- B. A laser beam alignment system shall be utilized for the laying of the sanitary sewer pipe. The laser beam alignment systems shall be approved by the Engineer. In addition to the laser beam alignment system, grade stakes shall be set at 50-foot intervals and the laser setup shall be checked every 50-foot with the grade stakes. In the event discrepancies

exist, installation shall be halted until resolved and the Engineer shall be contacted.

- C. All products shall be inspected for defects and cracks before being lowered into the trench, piece by piece. Any defective, damaged or unsound pipe, fitting or drainage structure or any product that has had its grade disturbed after laying, shall be taken up and replaced. Open ends shall be protected with a pipe plug to prevent earth or other material from entering the pipe during construction. The interior of the pipe shall be free from dirt, excess water and other foreign materials as the pipe laying progresses and left clean at the completion of the installation.
- D. Install piping system beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions. Follow product manufacturer's instructions for the use of lubricants, cements, and other special installation requirements.
- E. Use manholes for changes in direction or pipe size, unless fittings are indicated. Use fittings for branch connections, unless a direct tap into an existing sewer is indicated.
- F. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

4.4 Protection of Water Supplies

- A. When sanitary sewers are proposed in the vicinity of any water supply facilities, the following guidelines shall be followed.
- B. Horizontal Separation
 - 1. Sewers shall be laid at least 10-feet horizontally from any existing or proposed water main. The distance shall be measured outside edge to outside edge. In cases where it is not practical to maintain a 10-foot separation, the design engineer shall review the location of the sewer in relation to the water line and make adjustments or deviations as necessary.
- C. Vertical Separation
 - 1. Sewers shall be laid with at least 18-inches of vertical separation between the outside of the water main to the outside of the sewer. The crossing shall be arranged so that the sewer joints are equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to maintain line and grade.
- D. Special Construction Requirements
 - 1. When it is impossible to obtain proper horizontal and vertical separation as stated above, one of the following methods shall be implemented.
 - 2. The sewer shall be designed and constructed equal to water pipe, and shall be pressure tested at 150 psi to assure water tightness prior to backfilling.
 - 3. Either the water main or the sewer line shall be encased in a watertight carrier pipe which extends 10-feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of materials approved by the

regulatory agency for use in water main construction.

E. Sewer Laterals

1. All sewer laterals shall be set to grade and depth as required by the project plans. All lateral stubs which will not immediately be connected shall be plugged using an approved plug. Plugs shall be restrained by blocking and lateral ends shall be marked by the contractor once installed. Contractor shall supply a detailed listing of each lateral location by baseline station and offset for the end of each lateral at the right-of-way sewer line station at the mainline and sewer line station and offset for the end at the right-of-way of the lateral. The listing shall be submitted to the Engineer upon request.

F. Tap Connections

1. Inserta Tee® tap connection, or approved equal, may be utilized where service connections are to be connected to the mainline. Installation and backfill shall be as specified by the design engineer based on the configuration and overall cover height. Tap connections shall not degrade the overall system quality or performance.

G. Trench Excavation

1. Excavate trenches to ensure that sides will be stable under all working conditions. Slope trench walls or provide supports in conformance with all local and national standards for safety. Open only as much trench as can be safely maintained by available equipment. Backfill all trenches as soon as practicable, but not later than the end of each working day.
2. Where trench walls are stable or supported, provide a width sufficient, but no greater than necessary, to ensure working room to properly and safely place and compact haunching and other embedment materials. The space between the pipe and trench wall must be wider than the compaction equipment used in the pipe zone. Minimum trench width shall not be less than the greater of either the pipe outside diameter plus 16-inches or the pipe outside diameter times 1.25 plus 12-inches. In addition to safety considerations, trench width in unsupported, unstable soils will depend on the size and stiffness of the pipe, stiffness of the embedment and in-situ soil, and depth of cover.
3. When supports such as trench sheeting, trench jacks, trench shields or boxes are used, ensure that support of the pipe and its embedment is maintained throughout installation. Ensure that sheeting is sufficiently tight to prevent washing out of the trench wall from behind the sheeting. Provide tight support of trench walls below viaducts, existing utilities, or other obstructions that restrict driving of sheeting.

H. Dewatering

1. Do not lay or embed pipe fittings or drainage structures in standing or running water. At all times prevent runoff and surface water from entering the trench.
2. When water is present in the work area, dewater to maintain stability of in-situ and imported materials. Maintain water level below pipe bedding and foundation to provide a stable trench bottom. Use, as appropriate, sump pumps, well points, deep wells, geofabrics, perforated underdrains, or stone blankets of sufficient thickness to remove and control water in the trench. When excavating, while depressing ground water, ensure the ground water is below the bottom of

cut at all times to prevent washout from behind sheeting or sloughing of exposed trench walls. Maintain control of water in the trench before, during, and after pipe system installation and until embedment is installed and sufficient backfill has been placed to prevent flotation of the pipe, fitting, or drainage structures. To preclude loss of soil support, employ dewatering methods that minimize removal of fines and the creation of voids in in-situ materials.

I. Removal of Rock

1. Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between exposed rock and the pipe of at least 12-inches with a bedding width of 12-inches plus the outside diameter of the pipe. Where Bell-and-Spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined under Section 02300 Earthwork.

J. Removal of Unstable Material

1. Where wet or otherwise unstable soil incapable of properly supporting the pipe system, as determined by the Engineer, is encountered in the bottom of a trench, such material shall be removed to at least 24-inches below bottom of pipe and replaced to the proper grade with select granular material and compacted as directed by the Engineer. Bedding width shall be a minimum of 3 times the outside diameter of the pipe but no greater than the outside diameter plus 4-feet. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Owner.

K. Bedding

1. A stable and uniform bedding shall be provided for the pipe and any protruding features of its joint and/or fittings. The middle of the bedding, equal to one-third of the pipe outside diameter, shall be loosely placed while the remainder shall be compacted to a minimum of 90% of maximum density per AASHTO T99, or as shown in the plans. Pipe bedding shall be a minimum of 4 to 6-inches in thickness. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. Soil type shall be in accordance with ASTM D2321 and product manufacturer's published installation guidelines.

L. Placing Pipe

1. Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and the pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches shall be provided as directed by the Engineer; see dewatering section.

M. Jointing

1. Joints shall be constructed as described herein and in accordance with

- manufacturer's installation instructions.
2. All Bell-and-Spigot pipe joints shall be thoroughly cleaned. Joint lubricant, supplied by the manufacturer, shall be liberally applied to entire interior of bell and gasket on spigot prior to assembly.

N. Backfilling

1. Backfill material, placement, and compaction shall be constructed in accordance with the specifications herein and the product manufacturer's published installation guides.

O. Backfilling Pipe in Trenches

1. After the pipe and pipe system have been properly bedded, selected material from excavation, borrow, or imported at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layer depths to ensure minimum compaction density is obtained evenly throughout the backfill material. The backfill shall be brought up evenly on both sides of the pipe and pipe system for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12-inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8-inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Engineer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

P. Backfilling Pipe in Fill Sections

1. For pipe placed in fill sections, fill shall be constructed to at least 12-inches above the top of proposed pipe prior to trench excavation. Fill shall be placed in 12-inch lifts and shall be compacted to achieve 90% of maximum density, or as shown on plans. Once fill is placed and compacted pipe trench shall be constructed in accordance with the Trench Excavation section of this specification.

Q. Movement of Construction Machinery

1. When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or damage to the pipe shall be avoided. Any damaged pipe shall be repaired or replaced.

R. Compaction

1. Non-cohesive materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, non-cohesive soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

S. Minimum Density

1. Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.
2. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 95 percent of maximum density for cohesive material and 90 percent of maximum density for non-cohesive material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

T. Determination of Density

1. Testing shall be the responsibility of the Contractor and performed at no additional cost to the Owner. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval by the Engineer. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D1557 except that mechanical tampers shall be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D2922. When ASTM D2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in the calibration paragraph of the referenced publications. ASTM D2922 results in a wet unit weight of soil and when using this method ASTM D3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D3017 or ASTM D2922. Test results shall be furnished to the Engineer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

U. Pipeline Testing

1. Leakage Tests

- i. Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate.
- ii. Low pressure air testing for plastic pipe shall conform to ASTM F1417. When leakage exceeds the maximum amount specified, satisfactory correction, as approved by the Engineer, shall be made and retesting accomplished.
- iii. Infiltration and exfiltration testing shall conform to ASTM F2487. Prior to exfiltration tests, the pipe shall be completely backfilled. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Engineer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to

be tested. The filled line shall be allowed to stand until the pipe has reach equilibrium, not less than 4 hours and not greater than 72 hours. After equilibrium, the head shall be reestablished. The amount of water required to maintain this water level during a minimum 15-minute, maximum 24-hour test period shall be measured. Leakage as measured by the exfiltration test shall not exceed 50 gallons per inch in diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction, as approved by the Engineer, shall be made and retesting accomplished.

- iv. In lieu of low pressure air testing and infiltration/exfiltration testing in Sections B and C above, joint isolation testing of each joint may be performed in accordance with ASTM C1103. Air or water may be used to pressurize the void space being tested at the joint.

END OF SECTION 02623

SECTION 02640

VALVES AND APPURTENANCES

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 including the following:
 - 1. Providing valves, at the locations indicated and/or as directed, complete in place in accordance with the drawings and specifications.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 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 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. All valves furnished under the Contract shall be manufactured only in accordance with the Specifications and the approved drawings.
- C. Gate valves shall be assembled and tested in a certified ISO 9001:2000 facility within the United States, and tested in accordance with AWWA/ANSI specifications.
- D. All valves shall have three pressure tests performed to the requirements of AWWA C-509 specifications prior to shipment from the manufacturer: 1) 25 psi against each side of the closed wedge; 2) 250 psi against each side of the closed wedge; and 3) 500 psi shell test. Valves shall have a working pressure of 250 psi.
- E. All valves shall be covered by a Manufacturer's 10 year Limited Warranty from date of purchase.
- F. All valve coatings and materials shall be tested and certified to meet the requirements of ANSI/NSF-61.

PART 2 - PRODUCTS

2.1 RESILIENT GATE VALVES AND VALVE BOXES

- A. Valves shall be as manufactured by American AVK, or approved equal.
- B. Resilient wedge valves shall have mechanical joint ends or flanged ends as required to match with existing piping at each location.
- C. Resilient gate valves shall be iron body, resilient seated type. The valves shall be designed for 250 psi working pressure and 400 psi test pressure.
- D. Resilient gate valves shall meet the most recent version of the AWWA standard specification AWWA C509, including ANSI/NSF Standard 372.
- E. Tapping valves shall be resilient gate valves as specified above with the following exceptions. Tapping valves shall be full part opening and have flanged by mechanical joint ends.
- F. Valves are to have two upper stem seal O-rings, one above the thrust collar and one below as well as a lower stem seal O-ring will be provided to assure the upper stem seals can be replaced with the valve under full working pressure.
- G. Valves shall have a 2-inch operating nut marked with an arrow indicating the direction of opening, valves shall open (Right) clockwise. A cast iron handwheel, when specified, shall be used and marked in a similar fashion.
- H. The stem surface material shall be stainless steel, bronze or metal with a yield strength of 40,000 psi and a minimum corrosion resistance equivalent to bronze.
- I. Valve boxes shall be cast iron, tar coated, sliding, heavy pattern type, consisting of three (3) pieces; a flanged bottom piece, a flanged top piece, and a cover with two (2) lifting holes and the word "water" cast on the top. A minimum 6-inch overlap is required between sliding sections. The inside diameter of boxes shall be at least 5-1/4-inches and lengths shall be as necessary to suit ground elevation.

2.2 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves and valves shall conform to the AWWA specification for tapping sleeves and valves.
- B. Tapping sleeves shall be mechanical joint, two (2) part castings, flanged on the vertical centerline, and come complete with all joint accessories. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with gaskets recommended by the manufacturer. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket. Bolts shall be properly spaced to insure uniform gasket pressure and compression.

- C. Sleeve outlets shall have counter-bored flanges to insure proper centering of the tapping valve. Tapping sleeve to be Mueller, Rockwell, or approved equal.

2.3 INSERTION VALVES

- A. Insertion valves shall conform to AWWA specification for insertion valves.
 - 1. Sleeves shall be fabricated to assure a 360° seal around the pipe under working pressures up to 150 psi and test pressure of 220 psi.
 - 2. Sleeves shall be made of Type 304 Stainless steel (ASTM A-240) or ASTM 4-36 steel with fusion bonded epoxy.
 - 3. Gaskets shall be made of SBR material compounded for potable water use in accordance with ASTM D2000 3 BA715.

2.4 LINE STOPS

- A. Line stops fittings shall conform to AWWA specifications for line stops.
 - 1. Sleeves shall be fabricated to assure a 360° seal around the pipe under working pressures up to 150 psi and test pressure of 220 psi.
 - 2. Sleeves shall be made of Type 304 Stainless steel (ASTM A-240) or ASTM 4-36 steel with fusion bonded epoxy.
 - 3. Gaskets shall be made of SBR material compounded for potable water use in accordance with ASTM D2000 3 BA715.

PART 3 - EXECUTION

3.1 CLEANING AND PRIME COATING VALVES AND APPURTENANCES

- A. Prior to shop prime coating, all surfaces of the valves and appurtenances shall be thoroughly clean, dry, and free from all mill-scale, rust, grease, dirt, paint and other foreign substances to the satisfaction of the Engineer.
- B. All ferrous surfaces shall be sand blasted or pickled according to SSPC-SP6 or SSPC-SP8, respectively.
- C. All gears, bearing surfaces and other surfaces not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating unless otherwise specified herein. This coating shall be maintained as required to prevent corrosion during any period of storage and installation and shall be satisfactory to the Engineer through the time of final acceptance.

3.2 INSTALLATION

- 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. Care shall be taken to prevent damage to valves and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials, all debris and foreign material cleaned out of valve openings, and all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced.

3.3 SHOP PAINTING VALVES AND APPURTENANCES

- A. Valve body, bonnet and gland flange shall have an electrostatic applied, fusion-bonded epoxy coating internally and externally with a minimum of 8 mils. The coating shall meet or exceed the requirements of the AWWA C-550.

3.4 BURIED VALVES

- A. Buried valves and boxes shall be set with the operating stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve.

3.5 VALVE BOXES

- A. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform with the finished surface of roadway or other surface at the completion of the contract. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

3.6 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02640

SECTION 02645

HYDRANTS

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 includes the following:
 - 1. Providing hydrants, gate valves and boxes and appurtenant work, complete in accordance with the drawings and specifications.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Submit shop drawings and manufacturers descriptive literature, showing hydrant dimensions and features.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. All hydrants furnished under the Contract shall be manufactured only in accordance with the Specifications and the drawings, including ANSI/NSF Standard 372.

PART 2 - PRODUCTS

2.1 HYDRANTS

- A. Hydrants shall be American Darling Models B62 as directed or approved equal.

2.2 SAFETY FLANGE REPAIR KITS

- A. Safety flange repair kits shall come complete with stem coupling, safety flange, flange gasket, replacement bolts and nuts and hydrant lubricating oil.
- B. Safety flange repair kits shall be compatible with hydrant furnished.

2.3 EXTENSION KITS

- A. Extension kits shall come complete with extension barrel, extension stem, stem coupling and hardware, flange, flange gasket, 8 bolts and nuts and hydrant lubricating oil.
- B. Extension kits shall be compatible with hydrant furnished.

PART 3 - EXECUTION

3.1 HYDRANTS

- A. Hydrants shall be installed in conformance to AWWA C600, Section 11, latest revision using tie rods and anchored joints.
- B. Hydrants shall be set to the manufacture's bury line at the locations shown on the Drawings or as designated by the Engineer and shall be bedded on a firm foundation. A 5 cubic foot minimum drainage pit shall be filled with ½-inch crushed stone and satisfactorily compacted. During backfilling, crushed stone shall be brought up around, and 6-inch over, the drain ports.

Each hydrant shall be set in true vertical alignment and shall be properly braced. Thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench.
- C. Hydrants shall be rodded back to the pipe with suitable 1/2-inch stainless steel threaded rods or clamps, or galvanized as required, painted or otherwise rustproof treated. Hydrants shall be finish painted and touched up after installation.
- D. Hydrants set to high or to low shall be excavated and reset to the proper depth as indicated by the bury line. Hydrant extensions shall be installed where required to maintain proper depth.
- E. Upon installation of the hydrants, they shall be cleaned and painted in accordance with the Owner's color scheme.
- F. Remove and stack existing hydrants at as shown on the Drawings or as directed by the Engineer. Removed hydrants shall be delivered to the Owner's storage facility. The existing branch line shall be capped and the hydrant branch valve closed and the box removed.

3.2 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION 02645

SECTION 02647

CONNECTING TO EXISTING WATER MAINS

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 includes the following:
 - 1. Connecting to existing mains.
- B. Related sections includes the following:
 - 1. Section 02210 - Earthwork
 - 2. Section 02615 - Ductile Iron Pipe and Fittings
 - 3. Section 03300 - Cast-In-Place Concrete

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: The Contractor shall verify field conditions by test pits or other methods prior to construction.

3.2 INSTALLATION

- A. The Contractor shall make all connections to the existing mains as indicated in the Contract Documents.
- B. The Contractor shall develop a program for the construction and putting into service of the new work subject to the approval of the Engineer. All work involving cutting into and connecting to the existing water mains shall be planned so as to interfere with operation of the existing facilities for the shortest possible time.

- C. The Contractor shall have all preparatory work done prior to making the connection and shall provide all labor, tools, material, and equipment required to do the work in one continuous operation.
- D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting his operations to the requirements of the Owner.
- E. Under no circumstances shall any customer be without water for a period of more than 4 hours without prior written approval of the Owner. Should it appear that any customer will be without water for more than 4 hours, the Contractor shall install temporary water service at no additional cost to the Owner.
- F. The Owner does not guarantee a tight shut-off for existing local community water valves. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed. It shall be the responsibility of the Contractor to provide the means to dewater the excavation if required when making connections.
- G. The Contractor shall be responsible for the following restrictions on shutdown of water mains:
 - 1. One month advance notice for shutdown requests shall be given to the Owner's Project Site Representative and The Owner.
 - 2. Gloucester distribution system valves and hydrants to be operated only by Gloucester Utilities personnel.
 - 3. One week advance notice for shutdown request of water main shall be given to the Owner.

3.3 APPLICATION:

- A. Special Techniques: Tapping Connections:
 - 1. Tap connections to existing mains shall be made with service pressure in the main, using tapping sleeve and valve and a suitable tapping machine.
 - 2. Tapping valves shall be flanged by mechanical joint and be as specified in Section 02640 – VALVES & APPURTENANCES.
 - 3. Tapping sleeves shall be ductile iron with a split horizontal flange. Contractor shall verify existing pipe materials and diameter prior to ordering sleeves.
 - 4. Other connections to existing mains shall be made with the main out of

service, unless otherwise directed by the Engineer.

3.4 CLEANING

- A. Contractor shall clean the existing main with wire brush and wash the pipe surface and the tapping sleeve and valve interior with 5% hypochlorite (bleach) solution.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02647

SECTION 02652

EXTERNAL CHEMICAL SEALING FOR MANHOLES

PART 1 – GENERAL

1.1 SUMMARY

- A. This section governs all work, materials and testing required for the chemical grouting of manhole defects. Manholes or section of manholes with active leaks shall be repaired as indicated in Section 01010 – SUMMARY OF WORK.
- B. The Contractor shall be responsible for furnishing all labor, materials, equipment, and testing required for the completion of chemical grouting of manhole defects in Accordance with the Contract documents.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02763 – INTERIOR MANHOLE REHABILITATION

1.3 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Section 01300 – SUBMITTALS.
 - 1. Manufacturer to provide proof of product liability insurance, material data sheets, and MSDS sheets for all materials used in the grating/sealing process as well as manufacturer installation procedures.
 - 2. Provide case histories of successful use or defend choice of materials to the satisfaction of the Engineer.
 - 3. Submit manufacturer's recommended installation procedures for informational purposes.

1.4 MANUFACTURER'S RECOMMENDATIONS

- A. All materials, additives, mix ratios, and procedures needed for the grouting process shall be in accordance with manufacturer's recommendations. Manufacturer must provide proof of product liability insurance, material data sheets and MSDS sheets.

1.5 MANHOLES

- A. Manholes to be grouted are of brick, precast concrete or concrete block.

PART 2 – PRODUCTS

2.1 GROUTING MATERIALS

- A. Hydro-Active Chemical grout shall be an Acrylate or a Polyurethane based material designed for used in a wet environment. Material must be capable of with standing movement cased by thermal cycle changes and or settling of the structure.

2.2 GROUT MATERIALS

- A. Polyurethane Chemical Grouts
Hydro – Active Seal Foam by De neef or equivalent
- B. Acrylate Chemical Grouts
AV – 100 Acrylamide by Avanti or equivalent
AC – 400 Acrylate Chemical Grout by De neef or equivalent

2.3 INJECTION ACCESSORIES

- A. Oakcum Rope
Grout Needles
Flow Valve
Hydraulic Cement
- B. The following properties shall be exhibited by the grout.
 - 1. Documented service of satisfactory performance in similar usage.
 - 2. Controllable reaction times and shrinkage through the use additives supplied by the same manufacturer. The minimum set time shall be established so that adequate grout travel is achieved.
 - 3. Resistance to chemicals; to most organic solvents, mild acids and alkali.
 - 4. The chemical shall be essentially non-toxic in a cured form.
 - 5. The material shall be able to withstand freeze/thaw and moving load conditions

2.4 ADDITIVES

- A. Additives may be utilized for catalyzing the reaction, lowering the freezing temperature of the chemical, and minimizing dehydration of the materials.

2.5 MATERIAL IDENTIFICATION

- A. The Contractor shall completely identify the types of grout, mortar, and sealant used and provide case histories of successful use or defend the choice of grouting

materials based on chemical and physical properties, ease of application, and expected performance, to the satisfaction of the Engineer.

2.6 MIXING AND HANDLING

- A. Mixing and handling of chemical grout, which may be toxic under certain conditions shall be in accordance with the recommendations of the manufacturer and in such a manner to minimize hazard to personnel. It is the responsibility of the Contractor to provide appropriate protective measures to ensure that chemicals or gels are handled by authorized personnel in the proper manner. All equipment shall be subjected to the approval of the Engineer. Only personnel thoroughly familiar with the handling of the grouting material and additives shall perform the grouting operations.

PART 3 – EXECUTION

3.1 GENERAL

- A. Manhole grouting shall not be performed until the repair of the manhole frame and grade ring or any other structural manhole repairs are complete.

3.2 PRELIMINARY REPAIRS

- A. The Contractor shall cut and trim all roots within the manhole.
- B. The Contractor shall seal all unsealed lifting holes, unsealed step holes, voids larger than approximately one-half (1/2) inch in thickness. All cracked or deteriorated material shall be removed from the area to be patched and replaced with a waterproof quick setting mortar such as de neefs Dene-Plug or Dene-Plug hot or equivalent with manufacturer's specifications.
- C. The Contractor shall perform the Soakum Oakum Technique by soaking dry oil free oakum with HA Multi Gel and or HA Seal foam NF and forcing the Oakum/Resin plug into opening until it sets.

3.3 TEMPERATURE

- A. Normal grouting operations shall be performed in accordance with Manufacturer's recommendations.

3.4 GROUTING MATERIAL USAGE

- A. Grouting to a manhole may include corbel, wall, pipe seals, manhole joints, well to flattip joint, and or bench/trough. The Engineer will direct areas of the manholes designated to be grouted. If entire manhole is scheduled for grouting, grouting shall include corbel, wall, pipe seals, and bench trough. Pipe seal

grouting shall include all pipe seals in the specified manhole and grouting of the specified manhole including the bench/trough to the maximum height of 18 inches from crown.

3.5 DRILLING AND INJECTION

- A. Injection holes shall be drilled through the manhole wall at locations recommended by the manufacturer or as directed by the Engineer.
- B. Grout shall be injected through the holes under pressure with suitable injection packers and or wall spears. Injection pressure shall not cause damage to the manhole structure or surrounding surface. Grout shall be injected through the lowest holes first. The procedure shall be repeated until the manhole is externally sealed with grout.
- C. Grouting from the ground surface shall not be allowed unless interior gases are above average.
- D. Grout travel shall be verified by observation of grout to defects or adjacent injection holes. Provide additional injection holes, if necessary to ensure grout travel.
- E. Injection holes shall be cleaned with a drill and patched with a waterproof quick setting mortar such as Quadrex material or equivalent (Refer to Section 02763 – INTERIOR MANHOLE REHABILITATION).

3.6 TESTING OF REHABILITATED MANHOLES

- A. If exfiltration or vacuum testing is used, usually 10 percent of the sealed manholes, as chosen by the inspector, are tested. Manholes that fail are reworked and retested by the Contractor. If more than 5 percent of the manholes tested fail the initial test, an additional 10 percent of the sealed manholes are tested. This process continues until the testing is satisfactory or until all manholes have been tested. Limitations and considerations include recognizing the exfiltration and vacuum testing by be impractical or cost-prohibitive for all manholes; therefore, the use of either method is subject to the following limitations and considerations.
- B. Complete Sealing: These methods are used only when the entire manhole has been sealed or rehabilitated. The lack of sealing or rehabilitation of some portions of the manhole may prevent passage of either of these tests. Spot repairs and partial sealing or rehabilitation are therefore subject infiltration and visual testing only.

- C. Inlet and Outlet Sewers: Manholes built over a large diameter sewers may be impractical and uneconomical to test using either of these methods due to bypassing requirements, availability of plugs, and high forces that are generated on the plugs. Consideration must be given to these factors when determining the method of acceptance testing to be used.
- D. Structural Conditions: The structural condition of some manholes may be such that testing with these methods is impractical and destructive. The Owner's Representative and Contractor shall therefore deem as structurally sound, prior to testing and using these methods, those manholes that have not been structurally lined.

3.7 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02652

SECTION 02660

WATER SERVICES

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Copper water services and tubing.

1.2 RELATED WORK

A. DIVISION 1 – GENERAL REQUIREMENTS

1.3 SUBMITTALS

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

1. Submit manufacturer's technical product data or descriptive literature, or both, showing services, corporation stops, curb stops, fittings and other details for each type of service to be furnished for the project have been manufactured and tested in accordance with the most updated AWWA/ANSI specifications, including ANSI/NSF Standard 372.
2. For informational purposes only, submit manufacturer's written installation instructions.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water services materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

PART 2 - PRODUCTS

2.1 SERVICES

A. Unless otherwise specified, all pipe for services shall be Type "K" copper and shall conform to the provisions of AWWA specification C901.

2.2 CORPORATIONS, CURB STOPS AND SADDLES

A. The corporation stops shall meet the most recent revision of the AWWA standard "Threads for Underground Service Line Fittings" (AWWA C800). Corporation stops shall be Mueller 110, Model H-15008, designed for 175 psi test pressure and manufactured by Mueller Inc. Stops to have full keyway and rigid liners.

- B. Curb stops shall be Mueller H15219 Mark II Oriseal with drain suitable for use with polyethylene tubing specified hereinbefore. Stops shall have integral checks, O-ring seal and shall be furnished with rigid liners.
- C. Curb stop boxes shall be cast iron Buffalo type with recessed lid with pentagon bolt, adjustable sliding type.

2.3 FITTINGS

- A. Unless otherwise approved, only compression type fittings manufactured by Mueller Inc., or equal, shall be used.
- C. Adapters required to allow connection to existing services shall be provided.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. After successful testing and chlorination, water services and sample lines shall be installed as a "wet" tap as shown on the drawings, specified, or directed by the Engineer. Exact locations of services and sample lines shall be located in the field by the Engineer. All services shall be installed to a minimum depth of 4'-6" unless specifically shown or directed otherwise by the Engineer.

3.2 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02660

SECTION 02675

DISINFECTION OF WATER MAINS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Disinfection of pipelines.

1.2 RELATED WORK

A. DIVISION 1 – GENERAL REQUIREMENTS

B. Section 02615 – DUCTILE IRON PIPE AND FITTINGS

C. Section 02704 – PIPELINE PRESSURE AND LEAKAGE TESTING

1.3 SYSTEM DESCRIPTION

A. Disinfect all water main and appurtenances installed under this contract. Disinfection shall occur after successful pressure and leakage testing as specified in Section 02704 – PIPELINE PRESSURE AND LEAKAGE TESTING has been conducted.

B. The location of main line and appurtenances are shown on the Drawings.

C. Pipeline disinfection shall be performed in conjunction with the related work items of dewatering, testing, and discharge of chlorinated water, prior to placing newly installed water main in service. The Contractor's responsibility shall include, but not be limited to the following:

1. Provision of the chlorine product for disinfection at the rate and dose specified shall be in accordance with AWWA standards.
2. Provision of pipeline taps for dosing and testing of chlorinated water, as necessary.
3. Furnishing, installation and removal of bulkheads required for testing.
4. Labor and equipment necessary to dispense the dose chlorine at points and rates as directed by the Engineer.
5. Labor and equipment to operate newly installed mainline valves, air

release valves, and blowoff valves as necessary and directed by the Engineer.

6. Labor and equipment to dechlorinate the treated water prior to discharge.

D. The Contractor shall be responsible for disinfecting and putting into service new water mains or services.

E. Contractor shall be responsible for coordinating all activities with the Owner.

1.4 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Two weeks prior to initiating disinfection work, the Contractor shall submit to the Engineer a written workplan describing fully his proposed work. The workplan shall include, but not be limited to, the following:
 - a. List of main segments by valve or station locations.
 - b. Description of the pipe diameter and lengths to be tested.
 - c. Full description of method to be used (slug or continuous feed) in disinfecting the mains.
 - d. Chlorine agent to be utilized.
 - e. Chlorine material safety data sheets.
 - f. Chlorine batching calculations to show required level of chlorine being added to the mains.
 - g. Flushing methods listing pipe diameter, length, flushing time calculations and location of flushing outlets.
 - h. Methods of measuring chlorine solution being added to the pipe and after it has been added.
 - i. Sample collection techniques.
 - j. Names of personnel who will be conducting the disinfecting and sampling.
 - k. Name of laboratory proposed to perform the tests.
 - l. Dechlorination methods, including dechlorination agent and locations.
 - m. Backflow preventor data (model, size).
2. Engineer shall review the Contractor's workplan. Workplan shall be revised and resubmitted as required by the Engineer.
3. No disinfection work shall commence until Engineer approves the workplan.

1.5 QUALITY ASSURANCE

- A. Provide in accordance with GENERAL SPECIFICATIONS.

1.6 PROJECT/SITE CONDITIONS

- A. Contractor shall coordinate with the Owner and the Engineer to identify a water source to perform disinfection work as specified.
- B. All water shall be discharged in accordance with local, state and federal regulations.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate operation of existing valves, timing and duration of shut-down of existing mains, and disinfecting, and re-energizing of the water main with the Engineer and where applicable with the Owner including notification of the following prior to the stated work:
 - 1. Valve Operations: Notify Engineer and Owner one (1) working day prior to stated work.
 - 2. Disinfecting: Notify Engineer three (3) working days prior to stated work.
 - 3. Notification shall include location of work, length and diameter of the pipe to be disinfected and other pertinent information.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Calcium hypochlorite shall conform to AWWA B300.
 - 1. Granules with 70 percent available chlorine.
- B. Liquid sodium hypochlorite shall conform to AWWA B300.
- C. Backflow preventer devices (reduced pressure devices), model to be State approved.
- D. Line purge dechlorinator with dechlorination tablets or other method acceptable to the Engineer. Dechlorinator shall have 2-1/2 inch NPT coupling and capacity flow rates of up to 1,600 GPM. Dechlorination tablets shall be ascorbic acid, sodium sulfite or sodium thiosulfate, capable of dechlorinating the flushed water. Dechlorinator shall be H₂O Neutralizer as manufactured by Measurement Technologies, Inc., Redmond, WA (860-651-3368); Model LPD-250 as manufactured by J. Pollard Co., Hyde Park, NY.

- E. Chlorine residual analyzer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General:

1. Perform disinfection in accordance with AWWA C651.
2. The Engineer will review disinfection procedure, designate dosage and will perform necessary water quality tests to verify that disinfection has been accomplished according to public health standards.

- B. Flushing:

1. If water of sufficient quantity and pressure is available, flushing as specified here and after should be performed:

Prior to chlorination, mains shall be properly flushed by the Contractor. In general, flushing shall be performed at a flow rate required to achieve a minimum velocity of 2.5 feet per second (approximately 3600 GPM in a 24-inch main, 2400 GPM in a 20-inch main, 1600 GPM in a 16-inch main, 900 GPM in a 12-inch main, 400 GPM in a 8-inch main, 220 GPM in a 6-inch main, and 30 GPM in a 2-inch main). Flushing shall be performed for a sufficient period of time to allow for a minimum of 3 volume changes of water in the main (approximately 20 minutes per 1000-foot of main at the above flow rate).

- C. Discharge:

1. Following disinfection, water with concentrations of chlorine shall be dechlorinated and discharged to the atmosphere.
 - a. The Contractor shall notify the Engineer and Owner of the specific location where chlorinated water will be discharged at least three (3) days in advance of proposed discharge.
2. Water with high concentrations of chlorine (residual greater than 2 mg/l) shall be dechlorinated to a level of 2 PPM or less prior to its discharge. Dechlorination shall be conducted by use of a line purge dechlorinator or other method acceptable to the Engineer. Dechlorination shall be in accordance with the manufacturer's instructions and AWWA C651, Section 4.5.

3.2 INSTALLATION

A. Calcium Hypochlorite:

1. Use only as a solution.
2. Pump into pipe with a suitable chemical feed pump.

3.3 APPLICATION

A. Special Techniques:

1. Disinfect pipes by the continuous feed or slug method.
 - a. Continuous feed method:
 - 1) Feed chlorine into pipe so water entering contains 25 mg/l of available chlorine.
 - 2) Apply chlorine continuously until entire pipe is filled with chlorine solution.
 - 3) Retain treated water in pipe for at least 24 hours.
 - 4) Ensure that chlorine residual at end of test is at least 10 mg/l.
 - 5) Operate all valves and hydrants to insure disinfection. Manipulate valves to prevent super chlorinated water from entering existing distribution system.
 - b. Slug Method
 - 1) Slowly feed through the main a slug of water having a chlorine concentration of 100 mg/l so that all parts of the main and appurtenances are exposed to the highly concentrated solution for a period of at least three (3) hours.
 - 2) Water from existing distribution system or other approved supply source shall be made to flow at a constant measured rate, into the new main.
 - 3) At a point not more than ten (10) feet downstream from the beginning of the new main, water entering the new main shall receive a constant dose of free chlorine having a concentration of 100 mg/l.
 - 4) The free chlorine shall be measured as it moves through the main. If the level drops below 50 mg/l, flow shall be stopped chlorination equipment shall be relocated to the head of the slug and as flow is resumed, chlorine shall be applied to restore the free available level to 100 mg/l.
 - 5) Valves and hydrants shall be operated as the chlorinated water flows past them to insure disinfection occurs.

2. Ensure that appurtenances are fully disinfected.

3.4 FIELD QUALITY CONTROL

A. Tests:

1. Measure chlorine levels with meters or color-wheel. Paper pool strips are not acceptable methods for determining chlorine levels.
2. Bacteriological test samples shall be collected by the Contractor after the chlorine solution has been flushed out of the pipe.
3. Disinfection shall be repeated, as necessary, to produce satisfactory bacteriological samples.
4. Twenty-four (24) hours after the main has been dechlorinated and flushed, bacteriological samples shall be taken. Water samples shall be taken from corporation stops along the length of the water main as designated by the Engineer. Samples shall be taken between each valved section of main and each capped end of main, each in duplicate, in sterile bottles and furnished to the Engineer or Owner for delivery to a State approved laboratory for analyses.
5. Twenty-four (24) hours after the main has been dechlorinated and flushed, bacteriological samples shall be taken. Water samples shall be taken from corporation stops along the length of water main as designated by the Engineer. Twenty-four hours after the initial sampling round, a second round of water samples shall be taken. Samples shall be taken between each valved section of main and each capped end of main, each in duplication in sterile bottles and furnished to the Owner or Engineer for delivery to a State-approved laboratory for analyses.
6. The results of the tests on these samples will determine the acceptance of the work and allow these new mains to be connected to the Owner's system. The failure of any sample to pass the laboratory tests shall require the Contractor to re-flush and rechlorinate the mains and re-sample and test the water until acceptable results are obtained, all at no additional cost to the Owner.

B. Activation:

1. Upon receipt of satisfactory bacteria sample test results and successful pressure tests, Contractor shall notify Engineer. Copies of all test reports shall be given to the Engineer
2. Contractor shall note that work under this Contract shall not be considered completed until satisfactory installation and testing of the water mains have been completed.

3. All corporations installed for disinfection purposes shall be closed and plugged. All tubing shall be removed.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02675

SECTION 02704

PIPELINE PRESSURE AND LEAKAGE TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Perform field hydrostatic pressure and leakage testing of pipes.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02615 – DUCTILE IRON PIPE AND FITTINGS
- C. Section 02675 – DISINFECTION OF WATER MAINS

1.3 DEFINITIONS

- A. Leakage - Leakage is defined as total amount of water introduced into pipe during leakage test to maintain test pressure.
- B. Piping – Piping and pipe are defined as pipe, main, valves, fittings, hydrants, corporations and all other items installed under this contract.

1.4 SYSTEM DESCRIPTION

- A. Pipe installed under this contract shall be tested in accordance with the requirements of this section.

1.5 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTALS:
 - 1. Testing schedule and test procedure.
 - a. Indicate proposed time and sequence of testing on schedule.
 - b. Indicated test procedure requirements as follows:
 - (1) Limits of each pipe to be tested.

- (2) Position of all valves during testing.
 - (3) Location of temporary bulkheads.
 - (4) Other applicable procedures.
- c. List and description of equipment (pumps, meters, gauges, barrels) to be utilized.
- d. Pressure gauge calibration data.
- e. Disposal methods.

1.6 SEQUENCING AND SCHEDULING

- A. Complete pressure and leakage testing of pipes prior to final cleaning and disinfection; Engineer shall be present during all testing.
 - 1. Notify Engineer of time and place of testing at least 3 working days prior to commencement of work.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Provide test equipment as follows:
 - 1. Piping connections between pipe tested and water source.
 - 2. Equipment, materials, and facilities required to perform specified tests including but not limited to the following:
 - a. Pumping equipment.
 - b. Calibrated barrel.
 - c. Calibrated pressure gauges.
 - 3. Sectionalizing devices required including but not limited to the following:
 - a. Flanges
 - b. Valves
 - c. Bulkheads
 - d. Bracing

- e. Blocking
- f. Restraints

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide blocks, anchors, and supports for pipe being tested and adjacent existing pipe, valves and fittings before test pressure is applied.

3.2 INSTALLATION

- A. Water:

- 1. Schedule filling of line with Engineer at least three (3) working days in advance of testing.
- 2. Do not allow water to enter other parts of the pipeline, not subject to testing, unless approved by the Engineer.
- 3. After filling of pipe, wait 24-hours prior to initiating testing to allow for absorption.
- 4. Dispose of test water in a manner approved by the Engineer.

- B. Venting:

- 1. Ensure that air release valves and other venting devices are properly installed and placed in open position when filling pipe with water. Close and isolate air release valves and other venting devices after main is filled with water.
- 2. Do not close hand-operated vent valves until water flows in an uninterrupted stream from each valve.

3.3 APPLICATION

- A. Pressure Testing:

- 1. All pipe and appurtenances installed shall be hydrostatically tested in accordance with ANSI/AWWA C600, latest version unless stated otherwise herein.
 - a. Test pressure shall be measured and applied at the elevation of horizontal center line of pipe at selected location.
 - b. Multiply test pressure value in psi by 2.31 to obtain test pressure

value in feet.

- c. Ensure pressure gauges are accurately calibrated.
 - d. Do not attempt pressure testing until all air has been vented from the mains.
- 2. All new water mains which shall become the property of the Owner shall be pressure tested at 150 psi for a continuous period of two hours.
 - 1. Each valve shall be closed so that it is pressure tested on each side during the test procedure.
 - 2. After applying test pressure, wait until pressure stabilizes before starting test.

B. Leakage Testing:

- 1. Conduct leakage testing in conjunction with pressure tests.
- 2. Ensure that joints in piping are watertight and free from visible leaks during leakage test.
- 3. Leakage Test Pressure:
 - a. Maintain specified test pressure for pressure testing of reach during leakage test.
 - b. Maintain hydrostatic pressure within plus or minus 5 psi during entire time of leakage measurements.
- 4. Leakage Measurement:
 - a. Do not attempt measurement of leakage until pipe has been filled and allowed to sit for 24 hours, trapped air has been vented and constant test pressure has been established.
 - b. Measure leakage by means of an approved calibrated barrel on the suction side of the pump.
 - (1) Ensure that water barrel is accurately calibrated.
- 5. Allowable Leakage:
 - a. Pump the main to specified test pressure. When pressure is reached, stop pump. If pressure drops 5 psi or more, start pump and measure the quantity of water required to maintain the specified pressure. Repeat this process as required.

- b. Ensure that pipe reach does not exceed the allowable leakage rate or exceeds the allowable hydrostatic variation specified in Paragraph 3.3B.
- c. Calculate allowable leakage with following formula:

$$Q = 0.0075 D * L * N \text{ where;}$$

Q = allowable leakage in gallons per hour
D = nominal diameter of pipe in inches
L = length of section tested in thousand feet (1000-foot maximum)
N = square root of avg. test pressure in psi (N=12.25 for 150 psi test pressure)
- d. Calculate allowable leakage separately for each diameter and add resulting allowable leakage rates to obtain total allowable leakage for entire reach.
- e. Measure and record volume of water pumped into main to maintain test pressure. If actual volume exceeds the allowable, contractor shall stop test and initiate corrective measures.

3.4 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. Locate defective joints and pipe materials during pressure testing.
 - 2. Locate and repair leaking joints, valves and other defective items of work to reduce pipe leakage to an amount acceptable to Engineer.
- B. Repairs
 - 1. Repairs to pipelines shall require removal of the defective section of pipe, joint, valve or fitting.
 - 2. New materials to replace those replaced as described above shall be installed with mechanical joint solid sleeves. All mechanical joints shall be installed with restraints as specified in Section 02615.
 - 3. Disinfect the repair section in accordance with AWWA C651.
- C. Upon completion of repairs, Contractor shall repeat the pressure-leakage test until satisfactory results are obtained.
- D. All repairs, including labor, materials, equipment, traffic details, paving and other related costs required to locate and repair defective work shall be performed at no additional cost to the Owner.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02704

SECTION 02761

BYPASS FLOW HANDLING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Furnishing all plant, labor, equipment and materials, as well as performing all operations associated with handling bypass flows from the existing sewer and drain system around the work as required and/or indicated on the Drawings in accordance with these Specifications.
 - 2. Maintaining flow from main pipelines without interruption of service, and maintaining flow in lateral connections with minimal interruption of service.
 - 3. Performing the work in a sequence that is the least disruptive to vehicular and pedestrian traffic and in a manner that shall protect the public from damage to persons and property.
- B. Contractor shall design the bypass flow handling system and submit a Certificate of Design.

1.2 RELATED DOCUMENTS

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete bypass flow handling operations.
 - 2. Work plan including the following items:
 - a. Location, configuration routing of bypass flow handling pipes.
 - b. Staging area(s) for pumps and other equipment.
 - c. Upstream flow collection location and/or bulkheads.
 - d. Downstream discharge location.

- e. Method of protecting structures that accept discharge flows including modification and repair of structures as required..
 - f. Locations of individual bypass flow handling systems.
 - g. Sample notification of property owner service shutdown.
 - h. Traffic (vehicular and pedestrian) management plan around pumps suction and discharge locations, and pumping.
 - i. Roadway crossing details including hose ramps or trench details for buried piping.
 - j. Spill containment
 - k. Noise pollution abatement plan.
 3. List of 24-hour emergency telephone numbers at which the Contractor may be reached.
- B. Contractor shall submit a Certificate of Design (refer to Section 01300 – SUBMITTALS) for the bypass flow handling system and shall be responsible for the design of the following system components:
1. Pumps, including primary and secondary sound attenuated pumps.
 2. Generators and power sources.
 3. Suction and discharge piping, including fused HDPE as required.
 4. Temporary pipe supports and anchoring.
 5. Pipe plugging and bulkheads.
 6. Noise control equipment.
 7. Spill Containment
 8. Manhole modification.
 9. Calculation of average and maximum daily flows to be handled based on the pipe size, pipe material, and slopes confirmed in the field by the Contractor for each pipe segment to be bypassed.
 10. Calculations of static lift, friction losses, flow velocity and flow rate of the proposed bypass pumping system to confirm the calculated flows can be handled by the proposed system.
 11. Systems testing and start-up.
 12. Maintenance of system for off-construction hours.
 13. Contingency plan and equipment for system failures.

- C. Contractor shall submit complete documentation of qualifications as specified herein.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section GENERAL SPECIFICATIONS and as specified.
- B. The Contractor designing and installing the bypass flow handling system shall have completed at least five (5) projects of similar size and complexity as this project in the United States within the past three (3) years. Contractor may employ the services of a subcontractor that specializes in this work to fulfill this requirement.
- C. Rejection of any subcontractor and/or manufacturer by the Engineer due to insufficient qualifications shall not be grounds for modifications to the Contract Documents such as change in scope, time of completion or contract amount.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with GENERAL SPECIFICATIONS.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. The bypass flow handling equipment shall be of sufficient size and material to convey existing flows from one access structure to at least the next access structure immediately downstream of the work without overflow, spillage or discharge to the surrounding environment.
- B. Contractor shall be fully equipped to operate and respond to any repair or replacement of the system (24 hours per day and 7 days per week) while the bypass flow handling system is in use.
- C. Contractor shall incorporate noise reduction equipment to minimize impact on the surrounding environment. Such measures shall include insulated enclosures, hospital grade silencers or mufflers, equipment modifications and/or special equipment to limit noise to eighty (80) dBA at seven (7) feet or sixty (60) dBA at the nearest residence or business.

PART 3 – EXECUTION

3.1 PREPARATIONS

- A. Contractor shall perform all work in accordance with municipal, state and federal requirements.
- B. Contractor shall obtain relevant permits required to perform work prior to the commencement of construction at no additional cost to the Owner.

- C. Prior to the commencement of construction, Contractor shall perform all possible preparatory work. The Contractor shall, at all times, conduct operations to interfere as little as possible with existing flows.
- D. Contractor shall verify flow conditions in the existing system prior to the commencement of construction. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting its operations to the need for maintaining existing flows.
- E. Twice, prior to start-up of bypass flow handling system, Contractor shall notify, in writing, each property owner whose service shall be temporarily shut down within seven (7) days prior to the shut down and twenty-four (24) hours prior to the shut down. Contractor shall prepare notifications in accordance with Engineer's requirements.

3.2 GENERAL

- A. Contractor shall design the layout and routing of the bypass flow handling system to minimize disturbance to public and private land and to maintain access for pedestrians and traffic.
- B. The Contractor shall maintain traffic throughout the duration of bypass flow handling in accordance with the requirements of the "Manual on Uniform Traffic Control Devices", latest edition.
- C. If excavation is required across roadways, all work shall be performed in accordance with municipal and/or state requirements.
- D. Contractor shall furnish, install, maintain and operate all temporary facilities such as dams, pumping equipment, conduits and all other labor and equipment necessary to intercept the flow before it reaches points where it would interfere with the work.
- E. Contractor may utilize pipelines in an existing parallel system as an alternative to installing a full bypass flow handling system pending approval by the Engineer. Contractor shall submit a Certificate of Design prior to utilizing the parallel system and shall restore the parallel system to pre-construction conditions upon completion of construction.
- F. Contractor shall design, furnish and install individual bypass flow handling systems for flowing lateral connections or high occupancy buildings.
- G. Upon completion of construction, the Contractor shall remove plugging and/or bulkheads in a manner that permits the existing flows to slowly return to pre-construction conditions and prevent surcharging, flooding or causing any other disturbances downstream.

3.3 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.
END OF SECTION 02761

SECTION 02763

INTERIOR MANHOLE REHABILITATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment and incidentals required and eliminate infiltration from and rehabilitate the manholes on the Drawings in accordance with these specifications.
- B. All materials must be approved by the engineer or owner prior to job bid.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02652 – EXTERNAL CHEMICAL SEALING FOR MANHOLES
- C. Section 02765 – SEWER LINE AND MANHOLE CLEANING
- D. Section 03315 – GROUT

1.3 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Section 01300 – SUBMITTALS.
 - 1. All materials used to have proper submittals including manufacturer's recommendations for proper application, material data sheets and MSDS sheets.
 - 2. Submit manufacturer's recommended installation procedures for informational purposes.

PART 2 – DEFINITIONS

- 2.1 The term "approved" shall mean that the proposed material shall meet or exceed each of the performance criteria set forth in this specification. Manufacturers and vendors of various name brand materials must submit proof that any proposal material will meet the guidelines and requirements of this specification. The engineer or owner will make final approval of any proposed material.

PART 3 – APPROVED MATERIALS

3.1 INFILTRATION CONTROL

- A. All fast setting materials furnished shall be designed to be applied in dry powder form, with no prior mixing of water, directly to active leaks under hydrostatic pressure in manholes or related structures. Materials shall consist of rapid setting cements, silicious aggregates, and various accelerating agents. Materials shall not contain chlorides or metallic particles. Approved infiltration control material shall be Quadex Quad-Plug as manufactured by Quadex, Inc., Maumelle, Arkansas or equivalent.
- B. Specification Infiltration Control Materials
 - a. Compressive Strength (ASTM C109)
30 mins: 1850 psi; 3 days: 4000 psi; 7 days: 5000 psi; 28 days: 5890 psi
 - b. Bond Strength (ASTM C321)
30 min: 50 psi; 1 day: 50.85 psi
 - c. Set Time 30 seconds

3.2 INVERT REPAIR AND PATCHING

- A. All material furnished shall be designed to fill large voids in manhole walls and to repair or reconstruct inverts where no hydrostatic pressure exists. Materials shall consist of rapid setting cements, monocrySTALLINE quartz aggregates, and various accelerating agents. Material shall not contain chlorides or metallic particles. Approved invert repair and patching materials shall be Quadrex Hyperform as manufactured by Quadrex, Inc., Maumelle, Arkansas or equivalent.
- B. Specifications: Repair and Patching Materials
 - a. Compressive Strength (ASTM C109) 1 hour: 4170 psi, 3 hours: 5840 psi, 24 hours: 7660 psi.
 - b. Flexural Strength (ASTM C384) 1 hour: 450 psi, 3 hours: 625 psi, 24 hours: 820 psi.
 - c. Freeze-Thaw (ASTM C666) 300 cycles with no damage
 - d. Setting time (Gillmore ASTM C266) Initial 15-18 minutes; Final 22-25 minutes

3.3 CEMENTITIOUS COATING (LINER) MATERIALS FOR MANHOLE WALLS AND BENCHES

- A. All cementitious coating (liner) materials shall be specifically designed for the rehabilitation of manholes and other related wastewater structures. Liner materials shall be cement based, poly-fiber reinforced, shrinkage compensated, and enhanced with chemical admixtures and siliceous aggregates. Liner materials shall be mixed with water per manufacturer's written specifications and applied using equipment specifically designed for either low-pressure spray or centrifugal spin casting application of cement mortars. All cement liner materials must be capable of a placement thickness of ½" to 4" in a one pass monolithic application.
- B. Specifications: Cementitious Coating Materials
- C. Physical Properties: All cementitious coating materials shall conform to the following 28-day minimum physical properties.
 - a. Compressive Strength (ASTM C109) 9500 psi
 - b. Flexural strength (ASTM C293) 1400 psi
 - c. Bond Strength (ASTM C882) 1500 psi
 - d. Permeability (AASHTO T-277) Not to exceed 400 coulombs
 - e. Freeze-Thaw (ASTM C666) No damage in minimum 300 cycles
 - f. Material Wet Density Minimum 140 PCF
- D. All cementitious coating materials shall be approved for use based upon the following design conditions.
 - a. Low to mild hydrogen sulfide environments (pH > 2.0)
 - i. Cementitious coating materials shall be manufactured from 100% pure calcium aluminate cement and enhanced with high-density chemically stable aggregates. Materials shall contain poly fiber reinforcement and chemical admixtures. Approved material shall be Quadex Aluminaliner as manufactured by Quadex, Inc., Maumelle, Arkansas; or equivalent.

PART 4 – INTERIOR MANHOLE REHABILITATION

4.1 MANHOLE CLEANING AND PREPARATION

- A. The floor and interior wall of the manhole shall be thoroughly cleaned and made free of all foreign materials including dirt, grit, roots, grease, sludge and all debris or materials that may be attached to the wall or bottom of the manhole.
 - a. High pressure water blasting with a minimum of 3500 psi shall be used to clean and free all foreign materials within the manhole.
 - b. When grease and oil are present within the manhole, an approved detergent or muriatic acid shall be used integrally with the high pressure cleaning water.
 - c. All materials resulting from the cleaning of the manholes shall be removed prior to application of the cement based coating.
 - d. All loose or defective brick, grout, ledges, steps and protruding ledges shall be removed to provide an even surface prior to application of cement based coating.

4.2 SEALING ACTIVE LEAKS

- A. The work consists of hand applying a dry quick-setting cementitious mix designed to instantly stop running water or seepage in all types of concrete and masonry structures. The applicator shall apply material in accordance with manufacturer's recommendations and follow specifications. Drilling and pumping leaks with grout material will also be preformed (Refer to Section 02652 – EXTERNAL CHEMICAL SEALING FOR MANHOLES).
 - a. The area to be repaired must be clean and free of all debris per the guidelines set forth in Section 4.1 – Manhole Cleaning and Preparation.
 - b. Once cleaned, prepare crack or hole by chipping out loose material to a minimum depth and width of $\frac{3}{4}$ inches.
 - c. With gloved hand, place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 30 seconds, repeat until leak is stopped.
 - d. Proper application should not require any special mixing of product or special curing requirements after application.

4.3 INVERT REPAIR

- A. The work consists of hand mixing and applying a rapid setting, high early strength, non-shrink patching material to fill all voids and repair inverts prior to spray lining of the manhole. For invert repairs, flow must be temporarily restricted by inflatable or mechanical plugs prior to cleaning.
 - a. The area to be repaired must be cleaned and free of all debris per the guidelines set forth in Section 4.1 – Manhole Cleaning and Preparation.
 - b. Mix water shall be clean potable water and require no additives or admixtures for use with cementitious patch materials.
 - c. Cementitious material shall be mixed in a mortar tub or 5 gallon pail with water per manufacturer's specifications. Material should be mixed in small quantities, to avoid setting prior to placement in voids or inverts.
 - d. Bricks shall be cleaned and thoroughly wetted shortly before they are put into the work and each brick shall be laid in a full bed and joint of mortar
 - e. Flows in invert can be reestablished within 30 minutes of material placement.

4.4 APPLICATION OF CEMENTITIOUS MANHOLE LINER

- A. The work consists of spray applying and/or centrifugally spin casting a cementitious based liner to the inside of the existing manhole. The necessary equipment and application methods to apply the cementitious based liner materials shall be only as approved by the material manufacturer.
 - a. Material shall be mixed with water in accordance with manufacturer's specifications. Once mixed to proper consistency, the material shall be pumped via a rotor-stator style progressive cavity pump through a material plaster hose for delivery to the appropriate and/or selected application device.
 - b. Spray application of the cementitious material.
 - i. Material hose shall be coupled to a low-velocity spray application nozzle. Pumping of the material shall commence and the mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.
 - ii. Spraying shall be performed by starting at the manhole invert and progressing up the wall to the corbel and chimney areas.

- iii. Material shall be applied to a specified uniform minimum thickness no less than ½ inch. Material shall be applied to the bench area in such a manner as to provide for proper drainage without ponding.
- c. Centrifugal spin casting application of the cementitious material.
 - i. Material hose shall be coupled to a high speed rotating applicator device. The rotating casting applicator shall then be positioned within the center of the manhole at either the top of the manhole chimney or the lowest point elevation corresponding to the junction of the manhole bench walls.
 - ii. The high speed rotating applicator shall then be initialized, and pumping of the material shall commence. As the mortar begins to be centrifugally cast evenly around the interior of the manhole, the rotating applicator head shall be raised and/or lowered at a controlled retrieval speed conducive to providing a uniform material thickness on the manhole walls.
 - iii. Controlled multiple passes are then made until the specified minimum finished thickness is attained. If the procedure is interrupted for any reason, simply arrest the retrieval of the applicator head until flows are recommenced.
 - iv. Material thickness may be verified at any point with a depth gauge and shall be no less than a uniform ½ inch. If additional material is required at any level, the rotating applicator head shall be placed at that level and application shall recommence until that area is thickened.
- d. Material shall be applied only when manhole is in a damp state, with no visible water dripping or running over the manhole walls.
- e. The low-velocity spray nozzle and the centrifugal spin casting head may be used in conjunction to facilitate uniform application of the mortar material to irregularities in the contour of the manhole walls and bench areas.
- f. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in an upward motion, to compress the material into voids and solidify manhole wall. Precautions should be taken not to over trowel.
- g. Curing will take place once the manhole cover has been replaced. It is important that the manhole cover is replaced no more than 10-20 minutes after troweling is completed to avoid moisture loss in the material due to sunlight and winds.

- h. Material shall not be applied during freezing weather conditions. Material shall not be placed when the ambient temperature is 37 degrees Fahrenheit and falling or when the temperature is anticipated to fall below 32 degrees Fahrenheit during 24 hours.

PART 5 – QUALITY CONTROL

- 5.1 The quality and performance of the material shall be maintained by one or all of the following measures to be determined and specified by the engineer or owner.

5.2 PERFORMANCE TESTING

- A. Vacuum Testing
- B. Exfiltration Testing
- C. Visual Inspection

5.3 MATERIAL TESTING

- A. One 2x2 inch sample cube shall be taken for every 50 bags of material used. Sample shall be sprayed from nozzle, identified and sent to an independent test laboratory for compression strength testing as described in ASTM C-109.

PART 6 – WARRANTY

- A. Product manufacturers shall warrant all materials to be free of defects product design and workmanship for a period of one year from date of Substantial Completion. Manufacturer will provide complete replacement of any product proven to be defective when applied in accordance with manufacturer's recommendations.

END OF SECTION 02763

SECTION 02765

SEWER LINE AND MANHOLE CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Furnishing all plant, labor, equipment and materials, as well as performing all operations associated with pipeline cleaning within the pipelines indicated on the Drawings in accordance with these Specifications.
 - 2. Furnishing all plant, labor, equipment and materials, as well as performing all operations associated with manhole and structure cleaning as indicated on the Drawings in accordance with these Specifications.
 - 3. Performing the work in a sequence that is the least disruptive to vehicular and pedestrian traffic and in a manner that shall protect the public from damage to persons and property.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02761 – BYPASS FLOW HANDLING.

1.3 SUBMITTALS

- A. General: Submit each item in this article according to the conditions of the Contract and Division 1, Section 01300 – SUBMITTALS.
 - 1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete pipeline cleaning operations.
 - 2. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete internal inspection operations to complete manhole and structure cleaning operations.
 - 3. Confined Space Entry certifications for all personnel entering pipeline or access structures.
- B. Contractor shall submit complete documentation of qualifications as specified herein.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified herein.

- B. The Contractor cleaning and internally inspecting the pipeline shall have completed at least three (3) projects of similar size and complexity as this project in the United States within the past three (3) years. Contractor may employ the services of a subcontractor that specializes in this work to fulfill this requirement.
- C. Rejection of any subcontractor and/or manufacturer by the Engineer due to insufficient qualifications shall not be grounds for modifications to the Contract Documents such as change in scope, time of completion or contract amount.
- D. All Contractor's personnel entering pipeline or access structures shall be Confined Space Entry trained per OSHA, Title 29 CFR 1910.46 and shall have a copy of their certification available on site at all times.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with GENERAL SPECIFICATIONS.

PART 2 - PRODUCTS

2.1 CLEANING

- A. Contractor shall use mechanical, hydraulically-propelled, and/or high-velocity cleaning equipment, which does not exert internal pressures great enough to damage the pipelines and associated structures. Selection of the cleaning equipment shall be based on the condition of the pipeline at the time work is scheduled to commence.
- B. Equipment shall include, at a minimum, the following:
 1. Motorized equipment complete with belt booster clutch, overload clutch or other means or devices that shall prevent damage to the pipeline and associated structures. Direct drive shall not be permitted.
 2. Standard mechanical equipment including a combination of rodding machines, boring machines, bucket machines, hydraulic balls, B-liners, cones, ferrets or similar equipment. Direct drive shall not be permitted.
 3. High pressure, hydraulically-propelled equipment and chemical compounds as approved by the Engineer.
 4. Mechanical cutting devices suitable for the removal of roots, gaskets, protruding lateral connections, etc.
 5. Footage metering devices for location of all equipment, devices and points of reference on measuring target that is known at all times at the ground level.

C. Hydraulic Sewer Cleaning Equipment

1. The equipment used shall be of a movable dam type and be constructed so that a portion of the dam may be collapsed at any time during the cleaning operation to

protect against flooding of the sewer. The movable dam shall be the same diameter as the pipe being cleaned and shall provide flexible scraper around the outer periphery to ensure total removal of grease. If sewer cleaning balls or other such equipment which cannot be collapsed instantly are used, special precautions against flooding of the sewers and public or private property shall be taken.

D. High Velocity Jet (Hydro-cleaning) Equipment

1. All high velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned. Equipment shall also include a high velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a long distance solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel. All controls shall be located so the equipment can be operated above ground.

E. Mechanical Cleaning Equipment

1. Bucket machines shall be in pairs and with sufficient powers to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive which could cause damage to the pipe shall not be acceptable.
2. Power rodding machines shall be either sectional or continuous type capable of holding a minimum of 750-ft of rod. The rod shall be specifically treated steel. To ensure safe operation, the machine shall have a fully enclosed body and an automatic safety release clutch or relief valve.

PART 3 – EXECUTION

3.1 GENERAL

- A. Sewer line walls shall be cleaned adequately to provide for a camera used in internal inspection to discern structural defects, misalignment and infiltration/inflow sources. Cleaning shall be performed immediately prior to internal inspection to preclude the buildup of debris from infiltration/inflow sources and discharges from upstream pipeline sections.
- B. Contractor shall perform all work in accordance with municipal, state and federal requirements including OSHA.
- C. Contractor shall obtain relevant permits required to perform work prior to the commencement of construction at no additional cost to the Owner.
- D. Contractor shall locate and uncover all manholes and/or access structures required to complete the work in accordance with this Section.

- E. Contractor shall maintain existing flows around the work during cleaning inspection operations in accordance with Section 02761.

3.2 PREPARATION

- A. Selection of cleaning equipment shall be based on the conditions of the manhole and sewer lines at the time the work commences.
 - 1. Light cleaning (small amounts of debris existing within the sewer line): Use balls, scooters, high pressure water jetting (maximum of three passes) equipment, brushes and swabs.
 - 2. Heavy cleaning (large deposits of debris or heavy root growth existing within the sewer line): Use bucket machines, scrapers and augers. Cleaning which requires more than three passes with hydraulic cleaning equipment to achieve acceptable results shall be considered heavy cleaning.
- B. Written authorization shall be requested and obtained prior to conducting any heavy cleaning. Authorization shall be required for each individual sewer reach. Heavy cleaning without prior authorization will not be paid for.

3.3 PERFORMANCE

- A. Contractor shall clean the pipeline and manholes to facilitate inspection, testing, and rehabilitation.
- B. Contractor shall protect the pipeline and manholes from damage that could be inflicted by use of cleaning equipment. Any damage inflicted, regardless of technique, shall be repaired by the Contractor to the satisfaction of the Owner, at no additional cost to the Owner.
- C. Each designated sewer manhole section shall be cleaned using hydraulically propelled, high velocity jet, or mechanically powered equipment. The equipment selected for cleaning shall be capable of removing dirt, grease, rocks, sand and other deleterious materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If successful cleaning cannot be performed from the second manhole, or the equipment fails to traverse the entire length between manholes, it will be assumed that major blockage exists and the cleaning effort shall be abandoned. Blockages, if any, shall be reported to the Engineer immediately.
- D. During all sewer cleaning operations, satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property being served by the manhole section involved. The flow of sewage in the sewer lines shall be used to provide necessary pressures for hydraulic cleaning devices whenever possible. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall

be obstructed so as to prevent its use in case of a fire in the area served by the hydrant, nor shall a hydrant be used for the purpose described unless a vacuum break is provided.

- E. Roots shall be removed in the designated sections where root intrusion is a problem. Special precautions should be exercised during the cleaning operation to assure virtually complete removal of visible roots from the joint area. Procedures may include the use of mechanical devices such as rodding machines, expanding root cutters, and porcupines; hydraulic procedures such as high pressure jet cleaners; or chemical root treatment.
- F. To aid in the removal of roots, pipeline and manhole sections which have root intrusion may be treated with an approved label herbicide. the application of the herbicide to the roots shall be done in strict accordance with the manufacturer's recommendations and product specifications in such a manner to preclude any damage to the surrounding vegetation. Vegetation damage for whatever reason shall be replaced with identical vegetation. All safety precautions recommended by the manufacturer shall be strictly adhered to concerning handling and application of the herbicide.
- G. All sludge, dirt, sand, rocks, grease, and other solid or semi-solid materials that may cause an obstruction or impede the inspection and/or construction shall be removed and disposed off site during cleaning operations in watertight containers in conformance with all applicable federal, state and municipal laws and regulations, at no additional cost to the Owner. All materials that will not cause an obstruction or impede the inspection and/or construction shall be flushed downstream, but not be allowed to enter surface water bodies.
- H. If during cleaning operations an obstruction is encountered, the Contractor shall prosecute cleaning operations from both the upstream and downstream directions. Should the obstruction prevent the pipeline from being cleaned, the Engineer shall be notified immediately. If, in the opinion of the Engineer, a point repair is required to facilitate cleaning, Contractor shall perform the repair and clean through said repair upon its completion. No additional compensation shall be paid to the Contractor for any portion of the pipe which requires re-cleaning after successful completion of the repair.
- I. All debris, residue and other materials resulting from cleaning operations shall be removed from the site no less often than at the end of each workday and shall be disposed of in an approved manner. Under no circumstances will the accumulation of debris, residue, etc, on the site beyond the stated time be permitted, unless prior written authorization is given for storage in totally enclosed containers.
- J. Contractor shall re-clean the pipeline, if in the opinion of the Engineer, materials have washed into the pipeline after acceptance of the cleaning and prior to construction at no additional cost to the Owner.

3.4 FIELD TESTING

- A. Acceptance of sewer line cleaning shall be contingent on satisfactory completion of the television inspection. If, in the opinion of the Engineer, the television inspection shows the cleaning to be unsatisfactory and/or not been completed in accordance with the Specifications, the sewer line shall be re-cleaned and re-inspected until the cleaning is shown to be satisfactory at no additional cost to the Owner. In areas where television inspection is not performed, a double squeegee (with each squeegee the same diameter as the sewer) shall

be pulled cleanly through each section between manholes as evidence of satisfactory cleaning.

- B. If internal sealing is to follow the television inspection, particular attention shall be given to the adequacy of the cleaning to ensure that proper seating of the sealing packer can be achieved.
- C. Refer to Section 02760 – PIPELINE INTERNAL INSPECTION for Internal Inspection Acceptance Requirements

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 02765

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement.

1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Product Data: For each type of manufactured material and product indicated.
 - 2. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - a. Indicate amounts of mix water to be withheld at plant for later addition at Project site.
 - 3. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
 - 4. Welding Certificates: Copies of certificates for welding procedures and personnel.
 - 5. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - a. Cementitious materials and aggregates.

- b. Form materials and form-release agents.
 - c. Steel reinforcement and reinforcement accessories.
 - d. Fiber reinforcement..
 - e. Admixtures.
 - f. Waterstops.
 - g. Curing materials.
 - h. Floor and slab treatments.
 - i. Bonding agents.
 - j. Adhesives.
 - k. Ready-mix concrete producer.
 - l. Epoxy joint filler.
 - m. Joint-filler strips.
 - n. Repair materials.
- 6. Minutes of preinstallation conference.
 - 7. Detailed cold-weather protection methods.

1.5 QUALITY CONTROL

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- D. Testing Agency Qualifications: Contractor shall employ a testing agency, acceptable to the Engineer and qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

- G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
 - 1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.
- I. Structural Tests and Inspections: The work included in this specification is subject to the structural tests and inspections required by Chapter 17 of the Massachusetts State Building Code.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide in accordance with GENERAL SPECIFICATIONS and as specified.
- B. Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Avoid damaging epoxy coatings on steel reinforcement.
 - 2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D 3963/D 3963M.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1, or better.
 - b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.

- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, Light Pole Piers, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1-1/2 inch to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing and for walls which are part of water containing tanks or structures.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, and as follows:
- D. Plain-Steel Wire: ASTM A 82, as drawn.
- E. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A coated, plain-steel wire.
- F. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- G. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 Cut bars true to length with ends square and free of burrs.
- C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.
- D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 755M.
- E. Mechanical Splices and Connections: Mechanical splices and connections shall be designed and fabricated to develop in tension and compression at least 125% of the specified yield strength of the rebar they connect.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Severe weathering region, but not less than 3S.
 - 2. Nominal Maximum Aggregate Size: 1-1/2 inches
 - 3. Nominal Maximum Aggregate Size: 3/4 inch
- D. Lightweight Aggregate: ASTM C 330.
 - 1. Nominal Maximum Aggregate Size: 3/4 inch
- E. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible

with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
 - b. Rheocrete 222+; Master Builders, Inc.
 - c. FerroGard-901; Sika Corporation.
 - d. or equal

2.6 FIBER REINFORCEMENT

- A. Carbon-Steel Fiber: ASTM A 820, deformed, minimum 2.4 inches long.
 - 1. Fiber: Type 2, cut sheet.
- B. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long. There shall be minimum 50,000,000 fibers in one pound.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carbon-Steel Fibers:
 - a. Dramix; Bekaert Corporation.
 - b. Fibercon; Fibercon International.
 - c. Zorex; Novocon International Inc.
 - d. or equal
 - 2. Monofilament Fibers:
 - a. Fibermix Stealth; Fibermesh, Div. of Synthetic Industries.
 - b. Forta Mono; Forta Corporation.

- c. Grace MicroFiber; W. R. Grace & Co., Construction Products Div.
- d. or equal

2.7 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Ribbed with center bulb.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. PVC Waterstops:
 - a. Greenstreak.
 - b. Meadows: W. R. Meadows, Inc.
 - c. Vinylex Corporation.
 - d. or equal
- C. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - b. Hydrotite; Greenstreak.
 - c. Adeka Ultra Seal; Mitsubishi International Corporation.
 - d. or equal

2.8 VAPOR RETARDERS

- A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials; or polyethylene sheet, ASTM D 4397, not less than 10 mils thick:
 - 1. Nonwoven, polyester-reinforced, polyethylene coated sheet; 10 mils thick.
 - 2. Three-ply, nylon- or polyester-cord-reinforced, laminated, high-density polyethylene sheet; 7.8 mils thick.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. This product shall not be used as a substituiom for curing compounds.
 - B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd dry.
 - C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 - D. Water: Potable.
 - E. Volatile Organic Compounds (VOC) shall meet maximum emission limits of authorities having jurisdiction at project site.
 - F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Evaporation Retarder:
 - 1) Eucobar; Euclid Chemical Co.
 - 2) E-Con; L&M Construction Chemicals, Inc.
 - 3) Confilm; Master Builders, Inc.
 - 4) Waterhold; Metalcrete Industries.
 - 5) or equal
 - b. Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 percent Solids:
 - 1) Klear-Kote WBII 20 percent; Burke Chemicals.
 - 2) Dress & Seal WB; L&M Construction Chemicals, Inc.
 - 3) Vocomp-20; W. R. Meadows, Inc.
 - 4) or equal
 - c. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
 - 1) Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
 - 2) Lumiseal WB Plus; L&M Construction Chemicals, Inc.
 - 3) Vocomp-30; W. R. Meadows, Inc.
 - 4) or equal

2.10 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
 - 3. Fly ash shall not be used.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Concrete mixes shall be designed for the classes indicated below and in accordance with the requirements indicated

Design Mix Schedule								
Class	Specified Compressive Strength (psi)	Minimum Cement Content (lb/cy)	*Maximum Water/Cementitious Ratio	Admixture				Density and Aggregate Size
				% Air Entrainment	Corrosion Inhibitor (gal./cy)	Fiber Reinforcement (lb/cy)	Silica Fume (%/wt. Cement)	
A	4,000	565	0.48	5.5+/-1	N/A	N/A	N/A	NW-3/4"
B	4,000	611	0.44	5.5+/-1	N/A	N/A	N/A	NW-3/4"
C	4,000	650	0.42	7.0+/-1.5	4	N/A	5	NW-3/4"
D	4,000	611	0.45	N/A	N/A	1 or N/A	N/A	NW or LW-3/4"
E	4,000	611	0.45	N/A	N/A	1 or N/A	N/A	NW-3/4" or 1.5"
F	4,000	611	0.45	5.5+/-1	3 or N/A	1 or N/A	N/A	NW-3/4" or 1.5"
G	1,500	N/A	0.76	N/A	N/A	N/A	N/A	NW-3/4"

* Total water in mix at time of mixing, including free water in aggregates.

1. Mix Classifications: The design mix classes indicated above shall be used as indicated on the Drawings and as follows:

Class B: Water, wastewater, and other environmental structures

Class C: Marine/waterfront structures

Class D: Suspended (elevated) slabs (interior)

Class E: Slabs-on-Grade (interior)

Class F: Slabs-on Grade (exterior)

Class G: Where ever low strength concrete fill is indicated

Class A: All other areas on Structural (S Series), Civil (C Series), Architectural (A Series) and Landscape (L Series) Drawings, not included above.

2. Lightweight Concrete: Proportion mix to produce concrete with a calculated equilibrium unit weight of 110 pcf plus or minus 3 pcf as determined by ASTM C 567. Concrete slump at the point of placement shall be the minimum necessary for efficient mixing, placing, and finishing.
 3. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in work.
- D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete.
 2. Other concrete: Not more than 4 inches.
- E. Admixtures: Subject to Engineer's approval, use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch, for concrete surfaces exposed to view.
 - 2. Class C, 1/2 inch, for other concrete surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete where indicated on Drawings.
- I. Do not chamfer corners or edges of concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting

Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 72 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. When cold weather concrete requirements apply, formwork shall be left-in-place for a minimum of 7 days.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 1. At least 70 percent of 28-day design compressive strength.
 2. Determine compressive strength of in-place concrete by testing representative field cured test specimens according to ACI 301.
 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- B. Fine-Graded Granular Material: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain required concrete cover. Do not tack weld crossing reinforcing bars, unless indicated on the Drawings.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, only where indicated on the Drawings.
 - 2. Do not install reinforcement into previously placed concrete.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
 2. Form using bulkhead forms with keys, unless otherwise indicated. Leave-in-place bulkhead forms are prohibited.
 3. Use a bonding agent at locations where indicated on Drawings, and where fresh concrete is placed against hardened concrete surfaces.
- C. Contraction (Control) Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Where contraction (control) joint spacings are not indicated on the drawings, they shall not be located more than 15 feet on-center. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness unless otherwise indicated. Grooved or sawed joints shall be provided as indicated.
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Saw cuts must be made within 12 hours of placement.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved in writing by Engineer.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures (superplasticizers) to mix.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Limit drop height of concrete off of chute to 60-inches (1500mm).
 - 2. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
 - 6. Pulling of welded wire fabric through wet concrete from subgrade is prohibited.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. The finish of formed surfaces shall proceed concurrently with, or immediately after the repair of surface defects. The selection of finishes shall be as indicated in the table below.

Concrete Finishes (Formed Surfaces)Location	Finish
Footings, exterior walls, pile caps, portions of grade beams below grade and all other concrete not exposed to view	Rough-Formed Finish
Walls, portions of grade beams above grade, and all other concrete surfaces exposed to view. Surfaces to be coated or covered with waterproofing, dampproofing, plaster or paint	Smooth-Formed Finish

- B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

- C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
- D. Smooth Rubbed Finish: Apply the following to smooth-formed finished concrete:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and levelness, F(L) 24.

2. Finish and measure surface so gap at any point between concrete surface and an unveled freestanding 10-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
 - a. 1/8 inch.
- C. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least three months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. 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.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and

primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall employ qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Quality control testing and inspection requirements are separate and distinct from structural test and inspections required by the Massachusetts State Building code, Chapter 17.
- C. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete, plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test

for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one additional set of four standard cylinder specimens for each composite sample, when outside air temperature is below or expected to fall below 40°F (4.4°C) that night. Also provide field cured cylinders to determine strength for form removal.
 7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days, two at 28 days, and one at 56 days.
- D. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- E. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi
- F. Test results shall be submitted in writing to the Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency shall conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer. Petrographical analysis to determine water/cement ratio cement content, hydrated cement content, etc. shall be performed by the testing and inspection agency as directed by the Engineer when test results indicate requirements have not been met.

3.17 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – CONTRACT CLOSEOUT.

END OF SECTION 03300

SECTION 03315

GROUT

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all materials for grout in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished grout, in accordance with the requirements of the Contract Documents.
- B. The following types of grout shall be covered in this Section:
 - 1. Non-Shrink Grout: This type of grout is to be used wherever grout is shown in the Contract Documents, unless another type is specifically referenced.
 - 2. Cement Grout
 - 3. Epoxy Grout
 - 4. Topping Grout

1.2 RELATED WORK

- A. Division 1 – GENERAL REQUIREMENTS
- B. Section 03300 – CAST-IN-PLACE CONCRETE

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of non-shrink and epoxy grout used in the work.

1.4 QUALITY ASSURANCE

- A. Field Tests:
 - 1. Cement Grout and Topping Grout
 - a. Compressive strength of cement grout and topping grout shall be tested in accordance with the requirements of ASTM C 109. The

frequency of tests shall conform to the requirements of Section 03300.

2. Prepackaged Grout

- a. Compression test specimens shall be taken during construction from the first placement of each type of grout, and for each different batch number of each type of grout thereafter. The specimens will be made by the Engineer or its representative.
- b. Compression tests and fabrication of specimens for non-shrink grout shall be performed as specified in ASTM C 109. A set of three specimens shall be made for testing at 24 hour, 28 days, and each additional time period as appropriate.
- c. Compression tests and fabrication of specimens for epoxy grout shall be performed as specified in ASTM C 579, Method B. A set of three specimens shall be made for testing at 24 hours, and each earlier time period as appropriate.

3. All grout, already placed, which fails to meet the requirements of these specifications, is subject to removal and replacement at the cost of the Contractor.

4. The cost of all laboratory and field tests on grout shall be borne by the Contractor, and the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall supply all materials necessary for fabricating the test specimens.

B. Construction Tolerances: Construction tolerances shall be as specified in the Section 03300 – CAST-IN-PLACE CONCRETE, except as modified herein and elsewhere in the Contract Documents.

PART 2 - PRODUCTS

2.1 CEMENT GROUT

- A. Cement Grout: Cement grout shall be composed of one part cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 days shall be 4000 psi.
- B. Cement grout materials shall be as specified in Section 03300 – CAST-IN-PLACE CONCRETE.

2.2 PREPACKAGED GROUTS

- A. Non-Shrink Grout:

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.
2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C-827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.
3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.
4. Application:
 - a. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout specified herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.
 - b. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

B. Epoxy Grout:

1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged. Epoxy grout shall be Burk Epoxy Anchoring Grout by The Burke Company, Sikadur 32 Hi-Mod by Sika Corporation, Richmond, VA, Sikadur 32, Hi-Mod Gel by Sika Corporation, Richmond, VA, or equal.

2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F.
4. The epoxy grout shall develop a compressive strength of 5000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (0.0 percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C 827.
5. The epoxy grout shall exhibit a minimum effective bearing area of 95 percent. This shall be determined by a test consisting of filling a 2-inch diameter by 4-inch high metal cylinder mold covered with a glass plate coated with a release agent. A weight shall be placed on the glass plate. At 24 hours after casting, the weight and plate shall be removed and the area in plan of all voids measured. The surface of the grout shall be probed with a sharp instrument to locate all voids.
6. The peak exotherm of a 2-inch diameter by 4-inch high cylinder shall not exceed 95 degrees F when tested with 75 degree F material at laboratory temperature. The epoxy grout shall exhibit a maximum thermal coefficient of 30×10^{-6} inches/inch/degree F when tested according to ASTM C 531 or ASTM D 696.
7. Application: Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the Contract Documents.

2.3 TOPPING GROUT

- A. Grout for topping of slabs shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as specified herein. All materials and procedures specified for normal concrete in Section 03300 shall apply except as noted otherwise herein.
- B. Topping grout shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45.
- C. Coarse aggregate shall be graded as follows:

US Standard Sieve Size	Percent By Weight Passing
1/2"	100
3/8"	90-100

No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

- D. Final mix design shall be as determined by trial mix design under supervision of the approved testing laboratory.
- E. Strength: Minimum compressive strength of topping grout at the end of 28 days shall be 3000 psi.

2.4 CURING MATERIALS

- A. Curing materials shall be as specified in Section 03300, for cement grout and as recommended by the manufacturer of prepackaged grouts.

2.5 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application.
- B. The slump for topping grout shall be adjusted to match placement and finishing conditions but shall not exceed 4 inches.

2.6 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300. The finish of the grout surface shall match that of the adjacent concrete.
- B. The manufacturer of Class A non-shrink grout and epoxy grout shall provide on-site technical assistance upon request.
- C. Base concrete or masonry must have attained its design strength before grout is placed, unless authorized by the Engineer.

3.2 GROUTING PROCEDURES

- A. Prepackage Grouts: All mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- B. Base Plate Grouting:
1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a one-inch thickness of grout or a thickness as shown on the drawings.
 2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The mixture shall be of a trowelable consistency and tamped or rodded solidly into the space between the plate and the base concrete. A backing board or stop shall be provided at the back side of the space to be filled with grout. Where this method of placement is not practical or where required by the Owner, alternate grouting methods shall be submitted for acceptance by the Engineer.
- C. Topping Grout:
1. All mechanical, electrical, and finish work shall be completed prior to placement of topping. The base slab shall be given a roughened textured surface by sandblasting or hydroblasting exposing the aggregates to ensure bonding to the base slab.
 2. The minimum thickness of grout topping shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2-inches wide by 1-1/2-inches deep.
 3. The base slab shall be thoroughly cleaned and wetted prior to placing topping. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat Type II cement grout shall be broomed into the surface of the slab just before topping of fill placement. The topping shall be compacted by rolling or tamping, brought to established grade, and floated..
 4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
 5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over

the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

3.3 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

END OF SECTION 03315

SECTION 03730

CONCRETE REHABILITATION

PART 1 – GENERAL

1.1 SUMMARY

This specification describes the filling of cavities, void, etc. with a silica fume, polymer-modified Portland cement mortar/concrete.

1.2 QUALITY ASSURANCE

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative
- C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.3 DELIVERY, STORAGE AND HANDLING

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

1.4 JOB CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45°F (7°C) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

1.5 SUBMITTALS

- A. Submit two copies of manufacturer's literature, to include: Product Data Sheets, and appropriate Material Safety Data Sheets (MSDS).

1.6 WARRANTY

- A. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

PART 2 – SCOPE: PRODUCT AND APPLICATION

2.1 ACCEPTABLE MANUFACTURERS

- A. Sika MonoTop 611, as manufactured by Sika Corporation, Lyndhurst, New Jersey, is considered to conform to the requirements of this specification and has performed satisfactorily for patching or overlaying for a minimum of three years.
- B. Substitutions: The use of other than the specified product will be considered providing the contractor requests its use in writing to the Engineer. This request shall be accompanied by (a) A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds the specified performance criteria, tested in accordance with the specified test standards; and (b) Documented proof that the proposed substitute product has a three year proven record of performance of patching or overlaying, confirmed by actual field tests and five successful installations that the Engineer can investigate.
- C. Certification from the manufacturer demonstrating compliance with the ISO 9000 quality standard in the development, manufacture, and sale of the product.

2.2 PERFORMANCE CRITERIA

Typical Technical Data (material and curing conditions at 73 F, 50% R.H.)

- A. Typical Properties of the mixed polymer-modified portland cement mortar:
 - 1. Working Time: approximately 30 minutes
 - 2. Finishing Time: 30-60 minutes
 - 3. Color: concrete gray
- B. Typical Properties of the cured polymer-modified portland cement mortar:
 - 1. Compressive Strength (ASTM C-109)
 - a. 1 day: 3,000 psi
 - b. 7 day: 5,500 psi
 - c. 28 day: 6,500 psi
 - 2. Splitting Tensile Strength (ASTM C-496) at 28 days: 500 psi
 - 3. Flexural Strength (Modulus of Rupture)(ASTM C-78) at 28 days: 720 psi
 - 4. Bond Strength (ASTM C-882 Modified) at 28 days: 2200 psi
 - 5. Chloride ion permeability (AASHTO T-277): < 600 coulombs
 - 6. The silica fume, polymer-modified portland cement mortar shall not produce a vapor barrier.

2.3 MATERIALS

- A. Silica-fume, Polymer-modified portland cement mortar:
 - 1. The mortar shall be a silica fume-enhanced, polymer-modified composition containing a blend of selected cements, plasticizing/water-reducing admixtures and shrinkage compensating agents.
 - 2. The material shall be non-combustible, either before or after cure.
 - 3. The silica fume, polymer-modified Portland cement mortar shall be supplied in a factory proportioned unit.
 - 4. The silica fume, polymer-modified Portland cement mortar must be placeable from 3 inches in depth and extendable in greater depths.
- B. To prepare the silica fume, polymer-modified portland cement concrete (for pumping): the factory proportioned unit may be extended with 34-36 lbs. of a minus ¼ in. clean, well-graded, saturated surface dry aggregate, having low absorption and high density. Aggregate shall conform to ASTM C-33. Aggregate must be approved for use by the Engineer.
- C. Materials for forming, as required for the designated work, shall be approved by the Engineer.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. Areas to be repaired must be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Mechanically prepare the concrete substrate to obtain a surface profile of +/- 1/16" (CSP 5 or greater as per ICRI Guidelines) with a new exposed aggregate surface. Area to be patched shall not be less than 1/2" in depth.
- B. Where reinforcing steel with active corrosion is encountered, sandblast the steel to a white metal finish to remove all contaminants and rust. Where corrosion has occurred due to the presence of chlorides, the steel shall be high pressure washed after mechanical cleaning. Prime steel with 2 coats of Sika Armatex 110 EpoCem as directed by manufacturer. (See Spec Component SC-201-0699)

3.2 MIXING AND APPLICATION

- A. Mixing the silica fume, polymer-modified portland cement mortar: Mix manually or mechanically. Manually mix in a wheel barrow or mortar box. Mechanically mix in appropriate sized mortar mixer or with a jiffy paddle and low speed (400-600 rpm) drill. Pour 4/5 of 1 gal. water in mixing container. Add Sika MonoTop while continuing to mix. Add additional water up to 1 gal. total. Mix to a uniform consistency for a maximum of three minutes.
- B. Mixing of the silica fume, polymer-modified portland cement concrete: Pour all, 1 gal., of water into the mixing container. Add Sika MonoTop while continuing to mix. Add

correct amount of the pre-approved coarse aggregate, 34-36 lb./unit maximum, and continue mixing to a uniform consistency. Mixing time should be 3 minute maximum.

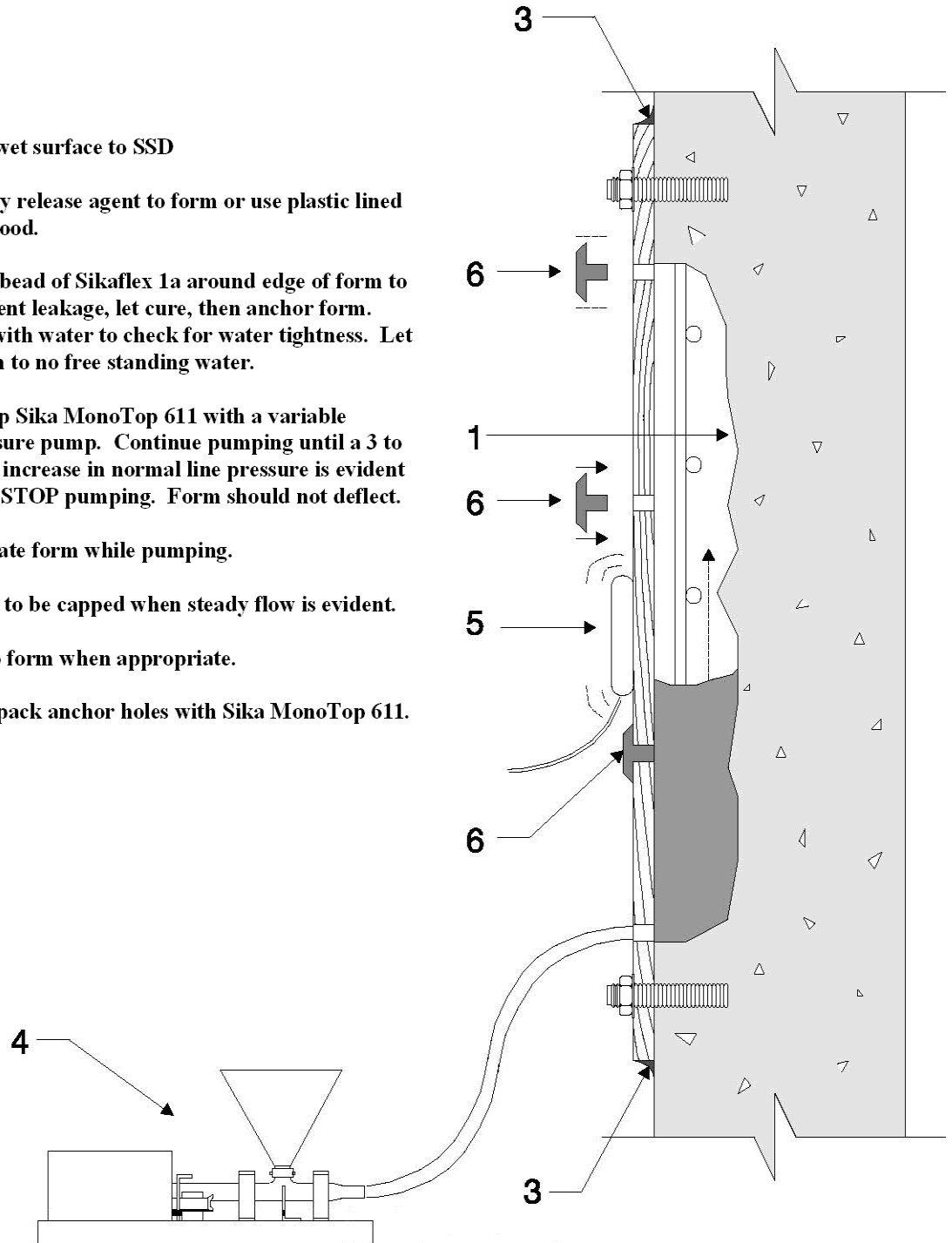
- C. Placement Procedure: At the time of application, the substrate should be saturated surface dry with no standing water. Within 30 minutes of mixing, pump the mortar/concrete into the prepared form. Work in a manner to avoid air entrapment with a variable pressure pump. Vibrate the form while pumping, as required, to achieve flow and compaction. After the mortar/concrete has achieved its final set, remove any forms and trim or shape exposed mortar/concrete to the desired profile if required.
- D. As per ACI recommendations for portland cement concrete curing is required. Only when ambient conditions of moisture, humidity, temperature and wind are sufficiently favorable is curing optional. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based* compatible curing compound. Moist curing should commence immediately after finishing. If necessary protect newly applied material from rain. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity.

*Pretesting of curing compound is recommended.
- E. Adhere to all limitations and cautions for the silica fume, polymer-modified portland cement mortar in the manufacturers technical data sheets and literature.

3.3 CLEANING

- A. The uncured silica fume, polymer-modified portland cement mortar can be cleaned from tools with water. The cured silica fume, portland cement mortar can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

1. Pre-wet surface to SSD
2. Apply release agent to form or use plastic lined plywood.
3. Run bead of Sikaflex 1a around edge of form to prevent leakage, let cure, then anchor form. Fill with water to check for water tightness. Let drain to no free standing water.
4. Pump Sika MonoTop 611 with a variable pressure pump. Continue pumping until a 3 to 5 psi increase in normal line pressure is evident then STOP pumping. Form should not deflect.
5. Vibrate form while pumping.
6. Vent to be capped when steady flow is evident.
7. Strip form when appropriate.
8. Dry pack anchor holes with Sika MonoTop 611.



END OF SECTION 03730

SECTION 05501

ANCHOR BOLTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies anchor bolts complete with washers and nuts.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS

1.3 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Section 01300 – SUBMITTALS.
 - 1. Proper submittal including load capacities, chemical resistance, temperature limitations, installation instructions and an evaluation report for expansion and wedge type anchors.
 - 2. Provide case histories of successful use or defend choice of materials to the satisfaction of the Engineer.
 - 3. Submit manufacturer's recommended installation procedures for informational purposes.

1.4 REFERENCES

- B. This section contains references to the following documents. They are a part of this section specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- C. Unless otherwise specified, references to documents shall mean the documents on effect at the time of Advertisement of Bids or Invitation of Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization, or if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to these documents shall mean the specific document version with a later date, discontinued or replace.

REFERENCE	TITLE
ANSI A58.1	Minimum Design Loads for Buildings and Other Structures
ASTM A36/A36M	Structural Steel
ASTM A307	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A320/A320M	Alloy-Steel Bolting Materials for Low Temperature Service
UBC	Uniform Building Code

PART 2 - PRODUCTS

2.1 GENERAL

- A. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a limiting maximum over sizing of 1/4-inch. Unless otherwise specified, minimum anchor bolt diameter shall be 1/2-inch.
- B. Tapered washers shall be provided where mating surface is not square with the nut. Upset threads shall not be acceptable.

2.2 MATERIALS

- A. Anchor bolt materials shall be as specified in Table A.

MATERIAL	SPECIFICATION
Steel bolts	ASTM A307, Grade A
Fabricated steel bolts	ASTM A36
Stainless steel bolts, nuts, washers	ASTM A320, Type 304 ^a
Expansion anchors	HILTI-BOLT, McCulloch Industries, or equal
Wedge anchors	ITT, Phillips Drill Co., or equal
Adhesive anchors	HILTI-HVA, PARABOND Capsule, or equal

^aUse Type 316 where specified

2.3 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01300 for all bolt systems not cast-in-place:
 - 1. Data indicating load capacities
 - 2. Chemical resistance
 - 3. Temperature limitations
 - 4. Installation instructions
 - 5. Evaluation report for expansion and wedge type anchors as specified in paragraph 05501-3.04.

PART 3 - EXECUTION

3.1 GENERAL

- A. Fieldwork, including cutting and threading, shall not be permitted on galvanized items. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Grouting or anchor bolts with non-shrink or epoxy grouts, where specified, shall be in accordance with Section 03315 – GROUT.

3.2 ADHESIVE ANCHOR BOLTS

- A. Use of adhesive or capsule anchors shall be subject to the following conditions:
 - 1. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.
 - 2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above 120 degrees F is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns shall be disallowed.
 - 3. Approval from Engineer for specific application and from supplier or equipment to be anchored, if applicable.
 - 4. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
 - 5. Embedment depth shall be as specified. Adhesive capsules of different diameters may be used to obtain proper volume of the embedment, but no more than two capsules per-anchor may be used. When installing different diameter capsules in the same hole, the larger diameter capsule shall be installed first. Any extension or protrusion of the capsule from the hole is prohibited.
 - 6. All installation recommendations by the anchor system manufacturer shall be followed carefully, including maximum hole diameter.
 - 7. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
 - 8. Holes shall be blown clean with compressed air and be free of dust or standing water prior to installation.
 - 9. Anchor shall be left undisturbed and unloaded for full adhesive curing period.
 - 10. Concrete temperature (not air temperature) shall be compatible with curing requirements of adhesives per adhesive manufacturer. Anchors shall not be placed in concrete below 25 degrees F.

END OF SECTION 05501

SECTION 07160

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- 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 the furnishing and application of bituminous dampproofing and, at all manholes and catch basins including surface preparation and appurtenant work, complete in place, in accordance with the Drawings and Specifications.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02252 – PRECAST CONCRETE MANHOLES

1.3 SUBMITTALS

- A. The Contractor shall submit manufacturer's technical product data on the bituminous dampproofing and installation instructions for all materials required under this section.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

- A. Bituminous dampproofing materials shall conform to Federal Specification SS-A-701 and shall be Dehydratine 4 as manufactured by W.R. Grace & Company; Tremco; Hydrocide 648 as manufactured by Sonneborn; or approved equal.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Bituminous dampproofing shall be applied in strict accordance with the printed instructions of the approved manufacturer. The surface must be clean and free of all foreign matter. Do not apply over a frost-covered surface. All cracks, voids, honeycombs, etc., shall be filled and repaired with mortar to provide a sound structural surface. No heating or thinning is required. If thinning is absolutely necessary, use a small amount of mineral spirits. Apply by brush or spray in a continuous unbroken film free from pinholes or other surface breaks. All surfaces to be dampproofed shall receive two coats. Each coat shall dry a minimum of 20 to 24 hours before application of the next coating. The second coat shall be applied perpendicular to the first. Allow a minimum of 48 hours for drying before backfilling. Each coat shall be applied at a rate

of 65 square feet per gallon. Bituminous dampproofing can be factory applied providing application meets coating manufacturer's requirements. Additional field coatings must be applied, as directed by the Engineer, to repair any coating imperfections and chipped or damaged areas.

END OF SECTION 07610

SECTION 16010

ELECTRICAL WORK - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish all labor, materials, equipment and incidentals required to make ready for use the complete electrical systems as shown on the Drawings and as specified hereinafter.
- B. In conjunction with other sections of Division 16, the work shall include furnishing and installing the following:
 - 1. Electric raceway systems
 - 2. Wires and cables
 - 3. Panelboards
 - 4. Miscellaneous equipment
 - 5. Grounding system
 - 6. Lighting system
- C. Make all necessary connections at "packaged" equipment furnished under other sections and Divisions of these specifications.
- D. Make all connections to equipment and devices furnished under Division 16 and other sections of these specifications except as otherwise specified.
- E. Connect process and instrumentation cables furnished with field-mounted equipment under other sections and Divisions of these specifications.
- F. It is the intent of these specifications that the electrical system shall be suitable in every way for the service required. All material and all work, which may be reasonably implied as being incidental to the work of this section shall be furnished at no extra cost to the Owner.

1.2 RELATED WORK

- A. The Contractor's attention is directed to the General Conditions, Supplementary Conditions.
- B. Excavation and backfilling required for underground electrical work is included under Division 2.
- C. Concrete work and reinforcing for electrical equipment pads is included under Division 3.
- D. Additional requirements are specified in Division 1 – General Requirements.

1.3 CODES, INSPECTIONS AND FEES

- A. All material and installations shall be in accordance with the latest edition of the Massachusetts Electrical Code and all applicable local codes and ordinances.
- B. Obtain all necessary permits and pay all fees for permits and inspections.

1.4 INTERPRETATION OF DRAWINGS

- A. The Drawings are not intended to show exact locations of conduit runs.
- B. Each three phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.
- C. Unless otherwise accepted by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- D. Where circuits are shown as homeruns, all necessary fittings and boxes shall be provided for a complete raceway installation.
- E. Any work, installed contrary to or without review by the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- F. The locations of equipment, shown on the drawings are approximate only. Exact locations shall be as determined by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an acceptable manner.
- G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.
- H. All connections to equipment shall be made as required and in accordance with the approved shop and setting drawings.

1.5 Shop Drawings: Submit the following in accordance with requirements of Section 01300 - SUBMITTAL PROCEDURES:

- A. Complete shop drawings shall be submitted for the motor control center, service entrance cubicle and engine-generator set.
- B. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment:

1. Conduit
 2. Wires and cables
 3. Lighting fixtures
 4. Circuit breakers
 5. Disconnect switches
 6. Panelboards
- C. Prior to submittal, all shop drawings and data shall be checked for accuracy and conformance to contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the specifications and drawings. This statement shall also list all discrepancies with the specifications and drawings. Shop drawings not so checked and noted shall be returned.
- D. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and drawings which may not be indicated on the shop drawings is included under the work of this section.
- E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this section.

1.6 MANUFACTURER'S SERVICES

- A. Furnish manufacturer's services for testing and startup of the engine-generator set.

1.7 ELECTRIC SERVICE

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials, where not specified, shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the Engineer.
- B. Materials and equipment shall be Underwriters' Laboratories, Inc. listed.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outdoors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, or shall be replaced at no additional cost to the Owner.

- D. The Contractor's attention is directed to the requirements of the various sections of Division 16 for additional product specifications.

2.2 MANUFACTURER'S NAMEPLATES

- A. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information may be die-stamped into the surface of the equipment or may be marked on durable nameplates permanently fastened to the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide and place all sleeves for conduit penetrations through floors, walls, partitions, etc. Locate all necessary slots and inserts for electrical work and place in forms before concrete is poured.
- B. Should the information given prove to be inaccurate or new locations be required, all cutting and patching shall be performed under Section 01030 and paid for by the Contractor at his own expense.
- C. Equipment shall be kept upright at all times. When large equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

3.2 RECORD DRAWINGS

- A. As the work progresses, legibly record (red line) as-built conditions on two sets of project contract drawings as specified in Section 01050. Prior to Substantial Completion of the project, submit the red lined prints to the General Contractor for use in preparation of the record drawings.

3.3 TESTS AND ADJUSTMENTS

- A. Test all systems furnished under Division 16 and repair or replace all defective work. Make all necessary adjustments to the systems and equipment and instruct the Owner's personnel in the proper operation of the systems and equipment. The Owner reserves the right to videotape the instruction sessions for future use in training.
- B. The Contractor's attention is directed to requirements of the various sections of Division 16 for additional test specifications.

END OF SECTION 16010

SECTION 16110

RACEWAYS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install the complete raceway systems, with all accessories, fittings, boxes, etc., as shown on the drawings and as specified hereinafter.
- B. The Contractor's attention is directed to the requirements of Section 16010, ELECTRICAL WORK - GENERAL PROVISIONS.
- C. Refer to National Grid for requirements for new NGrid electric conduit duct banks and manholes.

1.2 Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTAL PROCEDURES:

- A. Manufacturer's data and descriptive literature shall be submitted for the conduit.
- B. Complete catalog cuts of all raceways conduits, fittings, pullboxes, manholes, handholes, marked where applicable to show proposed materials and finishes.
- C. Dimensioned layout drawings of all duct bank routing, including elevations.

1.3 APPLICATIONS

- A. PVC fittings shall be used with PVC conduit.
- B. No conduit smaller than 3/4 inch electrical trade size shall be used, except as otherwise shown on the drawings. Box sizes shall not be less than that required by the Massachusetts Electrical Code.
- C. Refer to National Grid for requirements for new NGrid electric conduit duct banks and manholes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. MANHOLES AND HANDHOLES

Manholes and pullboxes shall be cast in place with construction and size as indicated. Precast manholes of similar size and loading may be accepted, subject to approval by the Engineer.

- 1. Covers shall be traffic type, H-20 loading, except as indicated otherwise. Manhole and pullbox covers shall be identified as "ELECTRIC" by raised letters cast into the covers. Manhole frames and covers shall be Neenah

Foundry No. R-1755-G or equal.

2. Manholes shall have frost-proof and water-tight grey iron frames and covers with solid lids and inner lids with 28-inch clear openings. All covers and lids shall be bolted to cast-in-place steel frames with corrosion resistant hardware. Frames shall be factory-primed; covers shall be cast-iron and shall have pick-holes.
3. The concrete envelope shall have a compression strength of 3,000 psi minimum.
4. Manholes and pullboxes shall be equipped with pulling-in irons opposite and below each duct way entrance.
5. PVC duct bank conduits shall be provided with end bells. Brackets, Unistrut Cat. No. P2515 or equal and 60-inch concrete inserts, Unistrut Cat. NO. P3261 or equal, shall be provided in manholes as required for racking wiring through manholes.
6. Handholes shall be 3' X 3' X 3', including pull wire blocks and designed for H-20 traffic loading.
7. Precast manholes and pullboxes shall be Brooks Mack, Quikset, U.S. Precast, or equal.

B. BOXES AND FITTINGS

PVC fittings shall be as manufactured by Carlon, an Indian Head Co.; Raco, Inc.; Robroy Industries; or equal.

Conduit elbows shall be of the same material and construction as the conduits to which they are connected.

Conduit hubs shall be as manufactured by Myers Electric Products, Inc.; Raco, Inc.; Appleton Electric Co.; or equal.

Fittings used with liquid tight, flexible conduit shall be of the screw-in, compression type with sealing ring. Fittings larger than 1-1/4 inch shall be furnished with integral ground lugs. Fittings shall be as manufactured by Thomas and Betts Co.; Crouse-Hinds Co.; Appleton Electric Co.; or equal.

Conduit wall seals shall be adjustable, compression type with PVC-coated steel pressure discs, neoprene sealing ring and stainless steel screws. Seals shall be O-Z/Gedney, Type CSM, or equal.

Hangers, rods, back plates, beam clamps, etc. shall be hot-dipped galvanized iron or steel. They shall be as manufactured by the Appleton Electric Co.; Thomas and Betts Co.; Unistrut Corp.; or equal. Items used in the chlorine room shall have a factory-applied PVC coating.

C. DUCTBANKS AND CONDUITS

PVC conduit shall be rigid polyvinyl chloride, Schedule 40, meeting the requirements, of UL 651 and NEMA TC-2, as manufactured by Carlon, an Indian Head Co.; Phillips Petroleum Co.; Triangle Pipe and Tube Co., Inc.; or equal.

Liquid tight, flexible metal conduit shall consist of a flexible, corrosion resistant metal core with an extruded, watertight, synthetic jacket. Conduits smaller than 1-1/2 inch shall have a continuous ground conductor under the jacket. Conduit shall be Sealtite Type UA manufactured by Anaconda Metal Hose Div., or as manufactured by American Flexible Conduit Co., Inc.; Universal Metal Hose Co.; or equal.

Ducts shall be encased in red-dyed concrete duct banks with steel reinforced bars. Concrete shall have 3,000 psi compressive strength. Colorant shall be an intergral red-oxide coloring pigment in the proportion of 8 pounds per cubic yard of concrete. Color treatment applied to the surface of the concrete encasement will not be accepted.

Duct banks shall contain a No. 4/0 base standard copper ground wire. The ground wire shall be continuous through the duct bank and terminate at power distribution equipment and ground grid.

Warning tape shall be 6 inches wide, red polyethylene not less than 6.0 mil thick with a minimum strength of 1,500 psi and shall be as manufactured by W.H. Brady Co.; Panduit Corp; Seton Name Plate Corp.; or equal. Tape shall have black lettering on two lines as follows:

1. For telephone conduits:

CAUTION CAUTION CAUTION
BURIED TELEPHONE LINE BELOW

2. For all other underground conduits:

CAUTION CAUTION CAUTION
BURIED ELECTRIC LINE BELOW

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Exposed conduits shall be run parallel to or at right angles to walls. Conduit runs shall be straight and true. Conduit shall be supported by means of one-hole pipe clamps. One screw backplates shall be installed to raise conduits from the surface. Multiple, horizo

- B. ntal runs shall be supported on trapeze hangers with steel horizontal members and threaded rods not less than 3/8 inches diameter. Hangers shall be attached to structural steel by means of beam clamps. Spot type inserts shall be used in concrete.
- B. Conduit bends shall be carefully made to prevent distortion of the circular degree bends between pulling points. Changes in direction shall be made with bends, standard elbows and pull boxes. Bends in parallel runs shall be concentric.
- C. Conduit shall not be supported from piping, piping supports, or mechanical equipment subject to vibration or removal.
- D. The ends of all conduits shall be tightly plugged during construction until wires are to be pulled. Spare conduits shall be furnished with threaded caps.
- E. Conduits shall be terminated at pressed steel boxes and ungasketed sheet metal enclosures with double locknuts and suitable bushings. Bushings installed on conduits containing ground wires shall be grounding type. Conduits shall be terminated at gasketed sheet metal enclosures with conduit hubs.
- G. Wire shall not be pulled until the conduit system is complete in all details.
- H. Pull wire shall be installed in all telephone conduits. Pull wire shall be 1/8 inch polypropylene with not less than 380 pound tensile strength.
- I. Conduit wall seals shall be installed at underground conduit wall penetrations in properly core-drilled holes with the screw heads accessible from the inside.
- J. Underground conduits shall be placed not less than 18-inches below finished grade or surface on a 4 inch layer of sand extending the full width of the trench. Conduits shall be spaced not less than 2 inches from other conduits. Underground conduits shall be covered with a 4 inch layer of sand. Additional backfill and surface finish shall be as specified under other sections of the specifications. Excavation and backfill to be performed by General Contractor.

Duct shall be assembled using high impact non-metallic spacers and saddles to provide conduits with vertical and horizontal separation. Plastic spacers shall be set every 5 feet. The duct array shall be anchored every 5 feet to prevent movement during placement of concrete.

The Contractor shall furnish and install a handhole adjacent to the designated locations and at intervals not to exceed 200 feet for straight runs. The Contractor shall avoid locating manholes and handholes in roadways where possible.

The duct shall be laid on a grade line of at least 3 inches per 100 feet, sloping towards pullboxes or manholes. Duct shall be installed and pullbox and manhole depths adjusted so that the top of the concrete envelope is a minimum of 18 inches below grade and a minimum of 24 inches below roadways.

Changes in direction of the duct envelope by more than 10 degrees horizontally or vertically shall be accomplished using bends with a minimum radius 24 times the duct diameter.

Duct couplings shall be staggered a minimum of 6 inches

The bottom of trench shall be of select backfill or sand

Each bore of the completed duct bank shall be cleaned by drawing through it a standard flexible mandrel one foot long and ¼-inch smaller than the nominal size of the duct. After passing of the mandrel, a wire brush and swab shall be drawn through.

Spare raceways which are not indicated to contain conductors shall have a 1/8-inch polypropylene pull cord installed throughout the entire length of the raceway.

Duct entrances shall be grouted smooth; ducts shall be terminated with flush end bells. Sections of pre-fabricated manholes and pullboxes shall be assembled with waterproof mastic and shall be set on a 6-inch bed of gravel as recommended by the manufacturer or as required by field conditions.

Duct penetration through walls of manholes, pullboxes, and buildings walls below grade shall be watertight.

Concrete encased duct bank shall terminate at building foundations. When duct enters the building on a concrete slab on grade, duct shall not be encased, but shall transition to rigid steep PVC-coated conduits on all stub-ups.

- K. Warning tape shall be installed over underground conduit runs except where conduits run under structural features. Tape shall be installed 12 inches below finished grade or surface.

Underground raceways shall be installed between manholes, handholes and pullboxes as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be fabricated with tools designed for this purpose. Factory elbows shall be utilized wherever possible.

Routing shall be adjusted to avoid obstructions. Coordinate with all other trades prior to installation of raceways. Lack of coordination shall not be justified for extra cost to the Owner.

- L. Underground conduit runs shall follow the drawings or as directed and shall run in straight lines as far as possible. Where deviation from a straight line becomes necessary, bends shall be of sufficient radius for the proper rodding and installation of cable. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be made by long sweep bends having a minimum radius of curvature of 25 ft., except that manufactured bends may be used at ends of short

runs of 100 ft. or less, and then only at or close to the end of the run. The long sweep bends may be made up of one or more curved or straight sections and/or combinations thereof. Manufactured bends shall have a minimum radius of 36 inches where a larger radius cannot be used.

Handholes and manholes shall be furnished and located as required by field conditions and at intervals not to exceed 200 feet for straight runs. The Contractor shall avoid locating manholes and handholes in roadways where possible.

- M. Handholes shall be installed 6 feet off the roadway on a 6 inch bed of stone with the top 4 inches above the finished grade. The power conduits shall angle up at 45 degrees into the handholes and terminate 6 inches above the stone base.
- N. Furnish one set of marked copies of contract drawings, showing the exact routing and depths of all underground conduit, and bends deviating from a straight line, shall be referenced dimensionally from fixed objects or structure.

END OF SECTION 16110

SECTION 16120

WIRES AND CABLES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish, install and test all wires, cable and appurtenances as shown on the drawings and as specified hereinafter.
- B. The Contractor's attention is directed to the requirements of Section 16010, ELECTRICAL WORK - GENERAL PROVISIONS.

1.2 Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTAL PROCEDURES:

- A. Manufacturer's data and descriptive literature shall be submitted for all wire and cable.

1.3 APPLICATIONS

- A. Wire for power and lighting circuits shall be Type XHHW.
- B. Wire for control, indicating and metering circuits shall be Type THWN, No. 14 AWG, 19-strand.
- C. Ground wires shall be Type XHHW or THWN, green.
- D. Except for control, indication, metering and signal wiring, no conductor smaller than No. 12 AWG shall be used. Wire sizes shall be not less than required by the Massachusetts Electrical Code.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Conductors shall be annealed, 98 percent conductivity, soft-drawn copper.
- B. All conductors No. 10 AWG and larger shall be stranded.

2.2 BUILDING WIRE

- A. Type XHHW wire shall be 600 volt, cross-linked polyethylene insulated, as manufactured by Pirelli Cable Corp., Collyer Insulated Wire Co.; the Okonite Co., or equal.
- B. Type THWN wire shall be 600 volt, cross-linked polyethylene insulated with nylon jacket, as manufactured by Pirelli Cable Corp., Collyer Insulated Wire Co.; the Okonite Co., or equal.

2.3 SIGNAL CABLE

- A. Instrumentation signal cable shall be twisted pair, No. 16 AWG, stranded conductor, 600 volt polyethylene insulated, aluminum tape 100 percent shielded, polyvinyl chloride jacketed with a No. 18 AWG stranded copper drain wire, Belden Corp. Cat. No. 8719, or equal.

2.4 TELEPHONE CABLE

- A. Telephone cable shall be 2 pair, No. 24 AWG solid copper conductor, 150 volt PVC insulated, PVC jacketed, UL Style 2576, Belden Corp., Cat. No. 9562, or equal.

2.5 WIRE MARKERS

- A. Wire markers shall be self adhesive, vinyl coated, polyester film.

2.6 TERMINALS

- A. Wire terminals shall be insulated, crimp type with tin plated, copper flanged fork and serrated barrel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All conductors shall be carefully handled to avoid kinks or damage to insulation.
- B. Lubrication shall be used to facilitate wire pulling. Lubricants shall be UL listed for use with the insulation specified.
- C. Crimp type terminals shall be used at all screw type control wire terminals.
- D. All wires and cables shall be uniquely identified with wire markers at each termination and splice.

3.2 TEST

- A. The service entrance wire shall be tested with a megohm meter after installation. Test shall be made at not less than 500 volts. Submit a written test report of the results to the Engineer.

END OF SECTION 16120

Attachments

1. Flow Assessment Services: Salem, MA Manhole Inspection Report (March 2015)
2. Flow Assessment Services: Salem, MA Flow Monitoring Data (March 2015)
3. Sluice Gate Chamber Inspection Photos 3/11/2015
4. South River Conduit CCTV Inspection Photos
5. CCTV Inspection Logs
6. ADS Pipe and Fitting Details
7. NGrid Email Correspondence

Attachment 1

Flow Assessment Services: Salem, MA Manhole Inspection Report (March 2015)

Manhole inspection information provided for general reference, contractor to complete additional inspections and measurements to confirm existing materials and dimensions. Contractor responsible to modify manholes as required to make connections, including coring manholes, removing steps, and rebuilding structures as required.

New England Civil Engineering Corporation
120 Washington Street, Suite 202E
Salem, MA 01970

March 31, 2015

Attn: William Ross

Re: Salem, MA
Manhole Inspection Report

Dear Mr. Ross,

We are pleased to provide you with the attached manhole inspection report for your use and review.

Appendix 1 contains the manhole inspection logs.

Appendix 2 contains drawn sketches with the dimensions of each location.

Appendix 3 contains all photos taken during the inspections.

A coding system is used to identify the condition of the manhole. The coding is explained below.

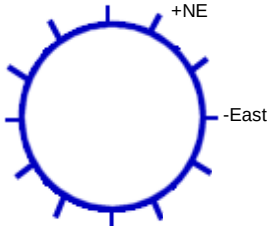
CONDITION CODES (1-5)

- 1) Good Condition - No Further Action Needed
- 2) Minor Defects Observed - No Immediate Action Needed
No I/I Observed
- 3) Minor Defects or I/I Potential - Needs Attention or Rehabilitation
- 4) Significant Defects and or I/I - Corrective Action Should Be
Scheduled In Near Future
- 5) Manhole or Connecting Pipes In Extremely Poor Condition
Failure Eminent: Needs IMMEDIATE Attention

If you should have any questions, please let us know.

Very Truly Yours,
Flow Assessment Services, LLC

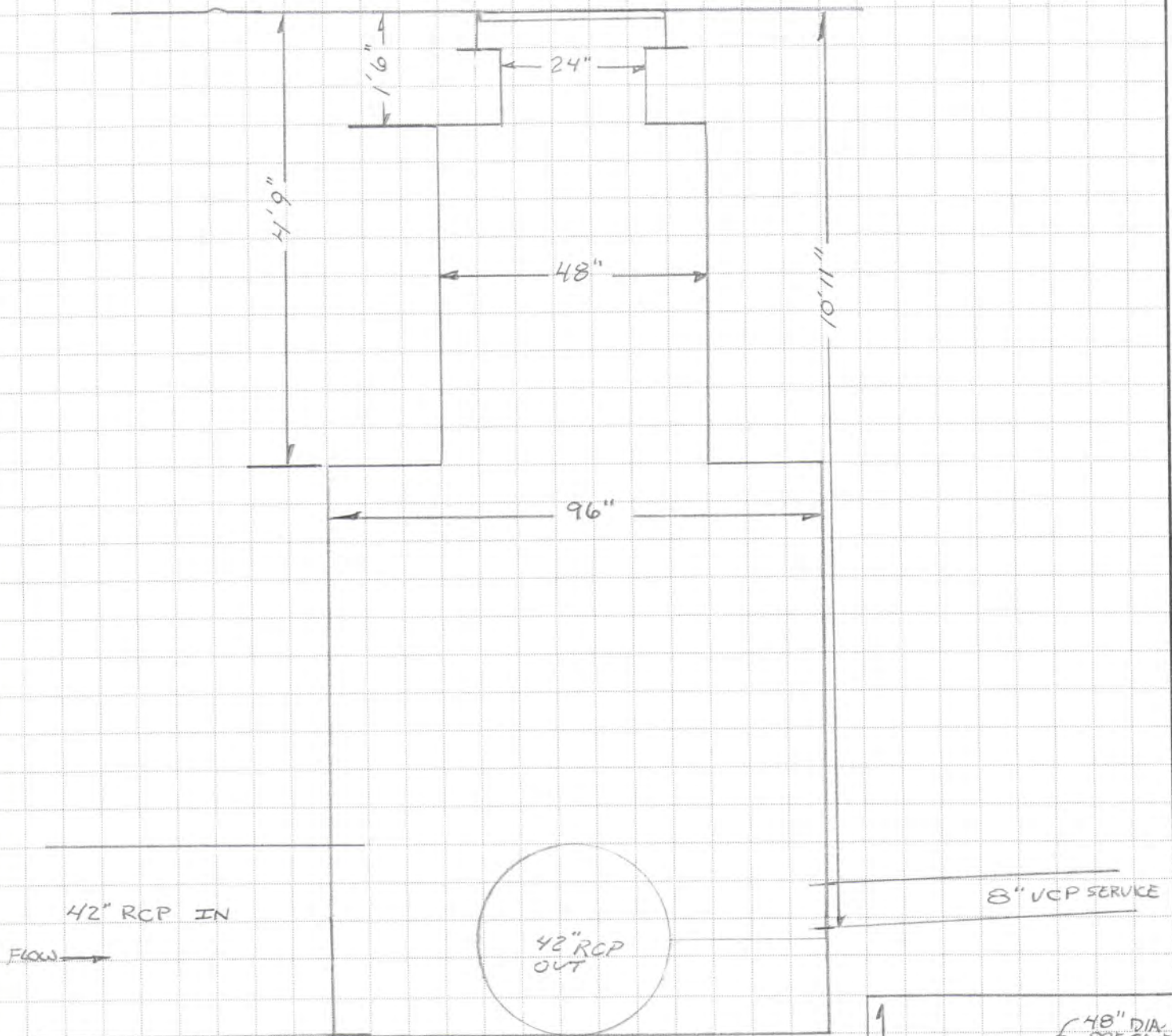
Sydney Irving
Project Manager

Structure Inspection Log										☐ Surface ☒ Internal																																																																																											
Municipality: Salem, MA					Manhole No.: A					↑ N  +South Ft. to DS MH #:																																																																																											
Street: Dodge Street at parking lot Near Washington Street					Sub-System:																																																																																																
Inspection Date: 3/26/2015		Inspector: TM/RM		Prefix #:		Weather: CLEAR		Temp: 0				Time:																																																																																									
COVER CHARACTERISTICS / COMMENTS Buried: ☐ CNL: ☐ CNI: ☐ Grade: AT In.					COVER INFLOW POTENTIAL Drainage Area 1: 3 X 3 X 0.9 = 8.1 (SQFT) Drainage Area 2: (if applicable) X X 0.3 = (SQFT)							Holes In Cover QTY SIZE (In) 2 1																																																																																									
General Comments:																																																																																																					
INTERNAL MANHOLE OBSERVATIONS Clear Opening Dia.: In. Inside Frame Dia.: 0 In. <table border="1" style="width:100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th>ITEM</th> <th>MATERIAL</th> <th>CONDITION</th> <th>Leaks (gpm)</th> <th>Photo</th> <th>DEFECTS</th> </tr> </thead> <tbody> <tr> <td>FRAME</td> <td>CAST</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>CORBEL</td> <td>PRECAST</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>STEPS</td> <td>ALUM</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>WALLS</td> <td>PRECAST</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>FLOOR</td> <td>PIP</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>INVERT</td> <td>PIP</td> <td>1</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> Surcharge From Invert: NONE EVIDENT Currently: Feet Marks To: Feet LINE CONDITIONS Image Path: P:\Salem, MA 15027\Manhole Inspection\Manhole Ins <table border="1" style="width:100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th>Direction (In / Out)</th> <th>Connect MH #</th> <th>Rim To Invert Depth</th> <th>Pipe Dia. (In.)</th> <th>Pipe Material</th> <th>Joint Length</th> <th>Flow Depth (In.)</th> <th>Debris Depth (In.)</th> <th>Pipe Conn Leak (gpm)</th> <th>Photo</th> <th>Line Cond 1-5</th> <th>Line Comments</th> </tr> </thead> <tbody> <tr> <td>IN FRO</td> <td>NE</td> <td>10' 11"</td> <td>8</td> <td>VCP</td> <td>5</td> <td>0.20</td> <td>0</td> <td></td> <td></td> <td>1</td> <td>Service line</td> </tr> <tr> <td>IN FRO</td> <td>South</td> <td>11' 06"</td> <td>42</td> <td>RCP</td> <td>8</td> <td>26.00</td> <td>2.00</td> <td></td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>OUT TO</td> <td>East</td> <td>11' 06"</td> <td>42</td> <td>RCP</td> <td>8</td> <td>26.00</td> <td>2.00</td> <td></td> <td></td> <td>1</td> <td></td> </tr> </tbody> </table>												ITEM	MATERIAL	CONDITION	Leaks (gpm)	Photo	DEFECTS	FRAME	CAST	1				CORBEL	PRECAST	1				STEPS	ALUM	1				WALLS	PRECAST	1				FLOOR	PIP	1				INVERT	PIP	1				Direction (In / Out)	Connect MH #	Rim To Invert Depth	Pipe Dia. (In.)	Pipe Material	Joint Length	Flow Depth (In.)	Debris Depth (In.)	Pipe Conn Leak (gpm)	Photo	Line Cond 1-5	Line Comments	IN FRO	NE	10' 11"	8	VCP	5	0.20	0			1	Service line	IN FRO	South	11' 06"	42	RCP	8	26.00	2.00			1		OUT TO	East	11' 06"	42	RCP	8	26.00	2.00			1	
ITEM	MATERIAL	CONDITION	Leaks (gpm)	Photo	DEFECTS																																																																																																
FRAME	CAST	1																																																																																																			
CORBEL	PRECAST	1																																																																																																			
STEPS	ALUM	1																																																																																																			
WALLS	PRECAST	1																																																																																																			
FLOOR	PIP	1																																																																																																			
INVERT	PIP	1																																																																																																			
Direction (In / Out)	Connect MH #	Rim To Invert Depth	Pipe Dia. (In.)	Pipe Material	Joint Length	Flow Depth (In.)	Debris Depth (In.)	Pipe Conn Leak (gpm)	Photo	Line Cond 1-5	Line Comments																																																																																										
IN FRO	NE	10' 11"	8	VCP	5	0.20	0			1	Service line																																																																																										
IN FRO	South	11' 06"	42	RCP	8	26.00	2.00			1																																																																																											
OUT TO	East	11' 06"	42	RCP	8	26.00	2.00			1																																																																																											



Structure Inspection Log										☐ Surface ☒ Internal																																											
Municipality: Salem, MA					Manhole No.: Meter 1					↑ N Ft. to DS MH #:																																											
Street: Washington Street at Mill Street					Sub-System:																																																
Inspection Date: 3/26/2015		Inspector: TM/RM		Prefix #:																																																	
Weather: CLEAR		Temp: 0		Time:																																																	
COVER CHARACTERISTICS / COMMENTS Buried: ☐ CNL: ☐ CNI: ☐ Grade: AT In.					COVER INFLOW POTENTIAL Drainage Area 1: 2 X 2 X 0.9 = 3.6 (SQFT) Drainage Area 2: (if applicable) X X 0.3 = (SQFT)					Holes In Cover QTY SIZE (In) 2 1																																											
General Comments:																																																					
INTERNAL MANHOLE OBSERVATIONS <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>ITEM</th> <th>MATERIAL</th> <th>CONDITION</th> <th>Leaks (gpm)</th> <th>Photo</th> <th>DEFECTS</th> </tr> </thead> <tbody> <tr> <td>FRAME</td> <td>CAST</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>CORBEL</td> <td>BRICK/PRECAST</td> <td>2</td> <td></td> <td></td> <td>Missing mortar - minor in brickwork</td> </tr> <tr> <td>STEPS</td> <td>ALUM</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>WALLS</td> <td>PRECAST</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>FLOOR</td> <td>PIP</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>INVERT</td> <td>PIP</td> <td>1</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> Clear Opening Dia.: In. Inside Frame Dia.: 0 In.												ITEM	MATERIAL	CONDITION	Leaks (gpm)	Photo	DEFECTS	FRAME	CAST	1				CORBEL	BRICK/PRECAST	2			Missing mortar - minor in brickwork	STEPS	ALUM	1				WALLS	PRECAST	1				FLOOR	PIP	1				INVERT	PIP	1			
ITEM	MATERIAL	CONDITION	Leaks (gpm)	Photo	DEFECTS																																																
FRAME	CAST	1																																																			
CORBEL	BRICK/PRECAST	2			Missing mortar - minor in brickwork																																																
STEPS	ALUM	1																																																			
WALLS	PRECAST	1																																																			
FLOOR	PIP	1																																																			
INVERT	PIP	1																																																			
Surcharge From Invert: NONE EVIDENT Currently: Feet Marks To: Feet																																																					
LINE CONDITIONS <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Direction (In / Out)</th> <th>Connect MH #</th> <th>Rim To Invert Depth</th> <th>Pipe Dia. (In.)</th> <th>Pipe Material</th> <th>Joint Length</th> <th>Flow Depth (In.)</th> <th>Debris Depth (In.)</th> <th>Pipe Conn Leak (gpm)</th> <th>Photo</th> <th>Line Cond 1-5</th> <th>Line Comments</th> </tr> </thead> <tbody> <tr> <td>IN FRO</td> <td>West</td> <td>20' 02"</td> <td>24</td> <td>RCP</td> <td>8</td> <td>17.75</td> <td>2.50</td> <td></td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>OUT TO</td> <td>SE</td> <td>20' 02"</td> <td>24</td> <td>RCP</td> <td>8</td> <td>17.75</td> <td>2.50</td> <td></td> <td></td> <td>1</td> <td></td> </tr> </tbody> </table> Image Path: P:\Salem, MA 15027\Manhole Inspection\Manhole Ins												Direction (In / Out)	Connect MH #	Rim To Invert Depth	Pipe Dia. (In.)	Pipe Material	Joint Length	Flow Depth (In.)	Debris Depth (In.)	Pipe Conn Leak (gpm)	Photo	Line Cond 1-5	Line Comments	IN FRO	West	20' 02"	24	RCP	8	17.75	2.50			1		OUT TO	SE	20' 02"	24	RCP	8	17.75	2.50			1							
Direction (In / Out)	Connect MH #	Rim To Invert Depth	Pipe Dia. (In.)	Pipe Material	Joint Length	Flow Depth (In.)	Debris Depth (In.)	Pipe Conn Leak (gpm)	Photo	Line Cond 1-5	Line Comments																																										
IN FRO	West	20' 02"	24	RCP	8	17.75	2.50			1																																											
OUT TO	SE	20' 02"	24	RCP	8	17.75	2.50			1																																											

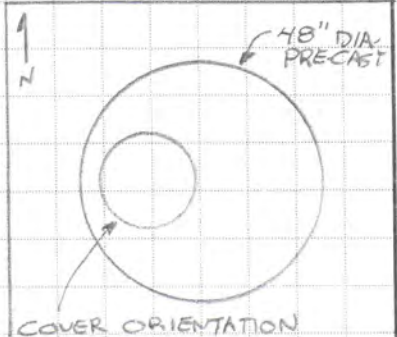
DODGE ST AT PARKING LOT



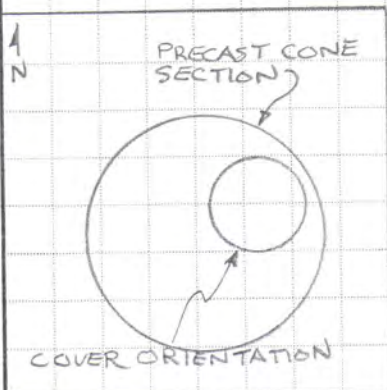
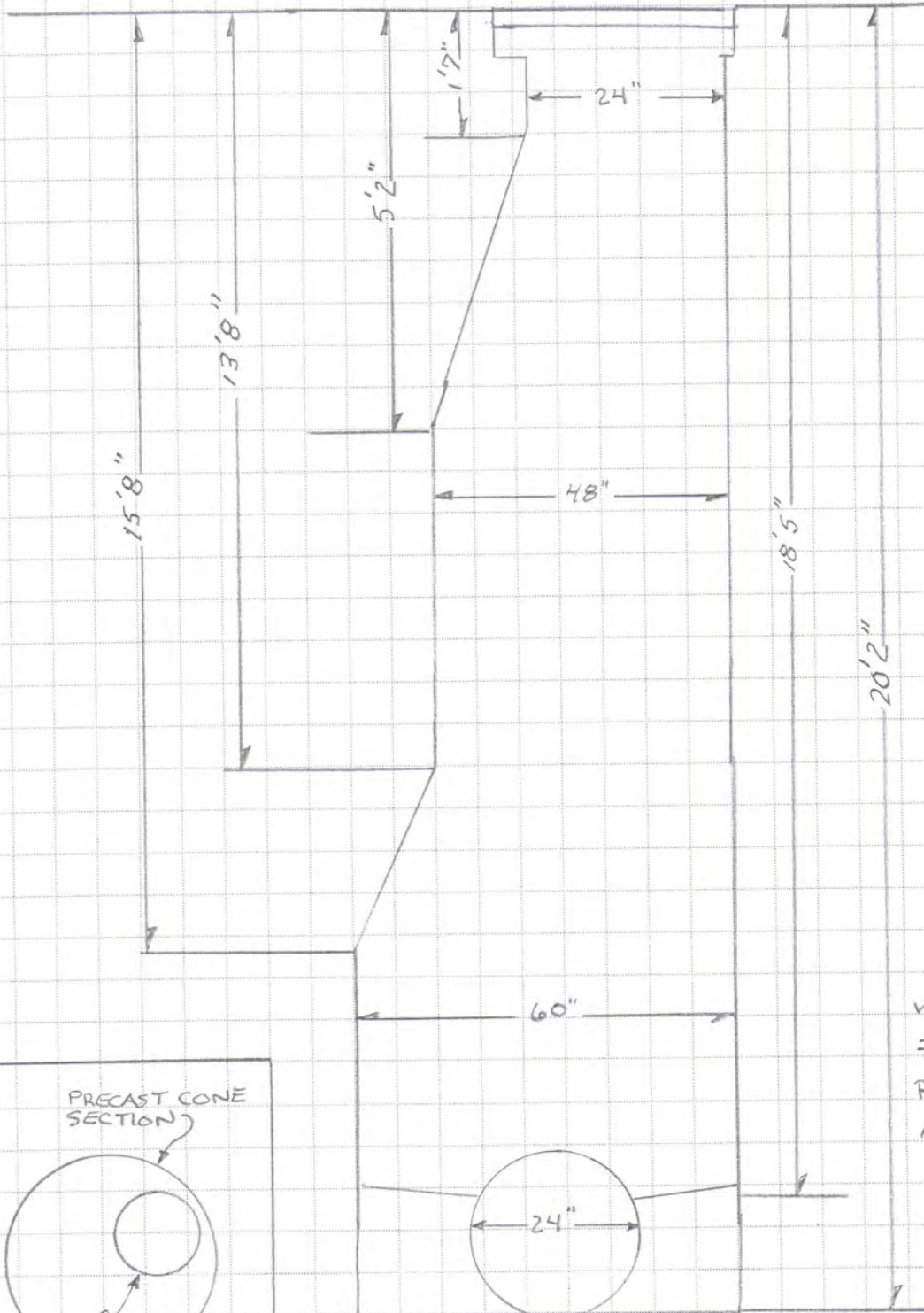
RIM TO FLOOR-WESTSIDE - 9'0"

RIM TO 42" RCP IN+OUT = 11'6"

ALUMINUM RUNGS ON WEST SIDE - REMOVE LOWER 2 RUNGS.



MILL ST AT WASHINGTON ST MANHOLE DETAILS





SALEM, MA
MANHOLE INSPECTION
PHOTO LOG

JPG # (OXX.JPG)	LOCATION	COMMENT (DEFECT OR OBSERVATION)
7134	Washington Street at Mill Street	Area
7135	Washington Street at Mill Street	View from top
7136	Washington Street at Mill Street	View from top
7137	Washington Street at Mill Street	View of incoming line
7138	Dodge Street at parking lot near Washington Street	View of incoming line
7139	Dodge Street at parking lot near Washington Street	View of outgoing line
7140	Dodge Street at parking lot near Washington Street	View of outgoing line
7141	Dodge Street at parking lot near Washington Street	View of incoming service line
7142	Dodge Street at parking lot near Washington Street	View of incoming service line
7143	Dodge Street at parking lot near Washington Street	View of incoming service line
7144	Dodge Street at parking lot near Washington Street	View from top



IMGP7134.JPG



IMGP7143.JPG



IMGP7135.JPG



IMGP7136.JPG



IMGP7137.JPG



IMGP7138.JPG



IMGP7139.JPG



IMGP7140.JPG



IMGP7141.JPG



IMGP7142.JPG



IMGP7144.JPG

Attachment 2

Flow Assessment Services: Salem, MA Flow Monitoring Data (March 2015)

Graphs of temporary flow monitoring in sewer manholes provided for general reference to allow contractor to size bypass pumping system. Flow will vary and may exceed the flow recorded during high sanitary use and wet weather.

Flow Analysis Graph

Site:

Site 1

Washington Street at Mill Street

Salem, MA

24" Circular line



Flow Analysis Graph

Site:

Site 2

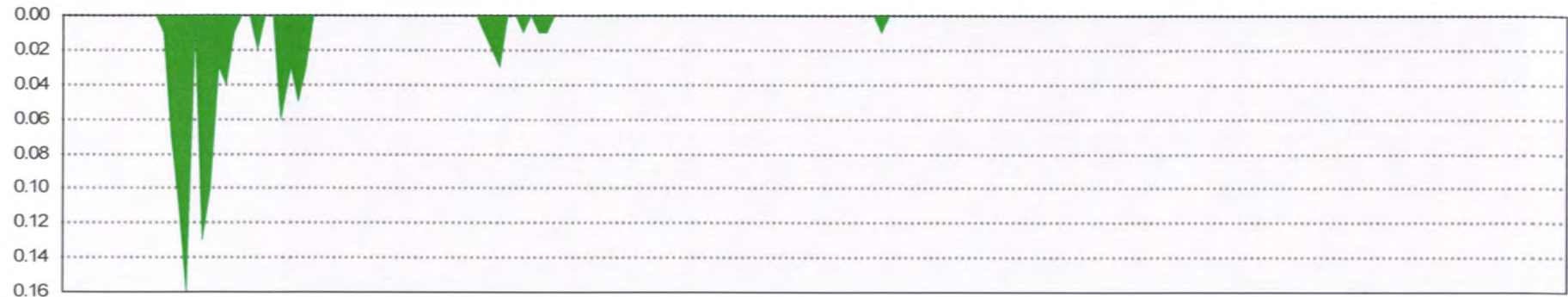
231-233 Washington Street parking lot

Salem, MA

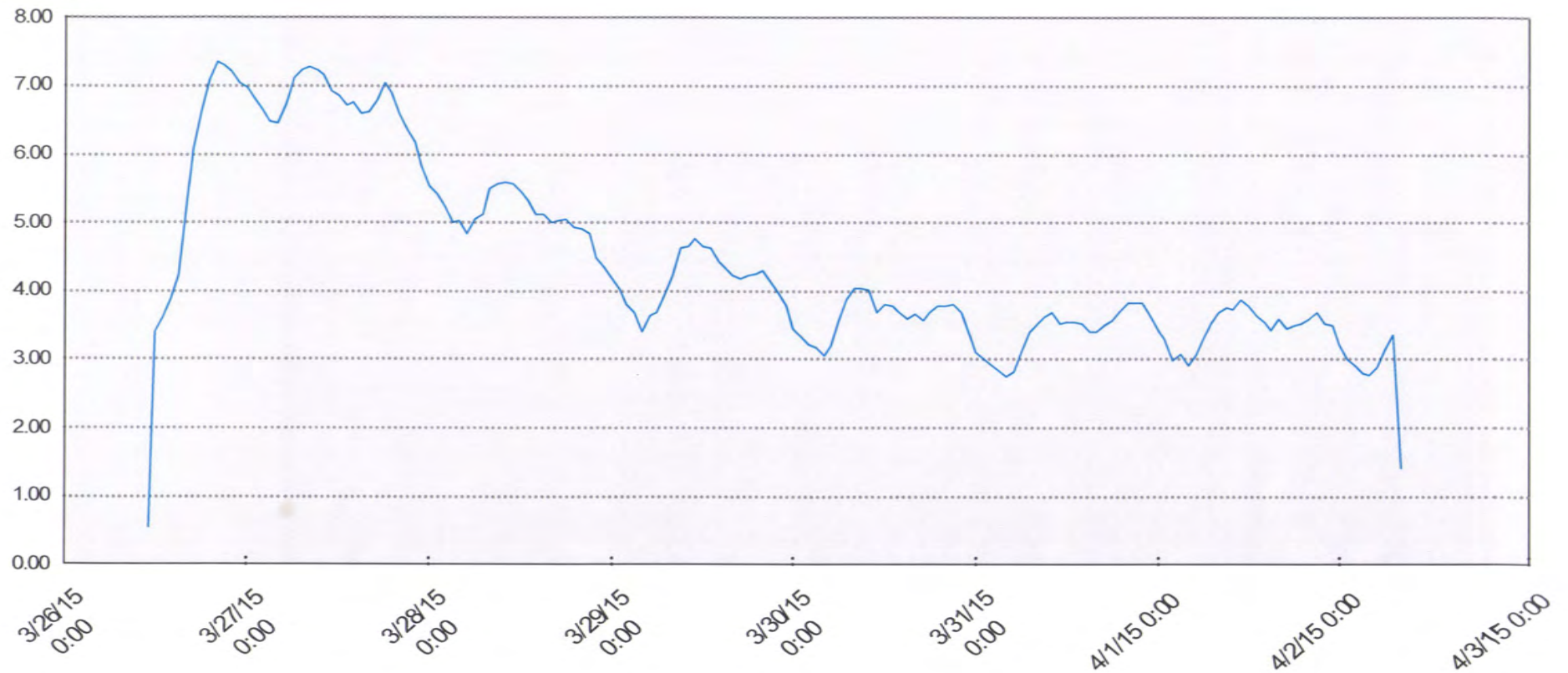


42" Circular line

Rain (in) Printed on: 4/2/2015 Period Covered: 03/26/2015 - 04/03/2015 Every 1 Hour



Flow (mgd)



Attachment 3

Sluice Gate Chamber Inspection Photos 3/11/2015

Photos provided for general reference, Contractor to complete additional inspections and measurements to confirm existing materials and dimensions of structure and equipment and materials to be removed.

Sluice Gate Chamber Inspection Photos 3/11/2015



Top level of chamber. View into chamber from ground level.



Top level of chamber. Ladder access , conduits and actuator wheel.



Top level of chamber. View of conduits and actuator wheel.

Sluice Gate Chamber Inspection Photos 3/11/2015



Access panel to lower level of chamber.
Panel covered by plywood and sheet metal.



View through access panel to lower level of chamber. View of sluice gates.

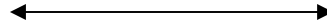


Floor thickness between levels is approximately 7 1/2".

Sluice Gate Chamber Inspection Photos 3/11/2015



Top and bottom view
of sluice gates.



Bricked outlet pipe.



Active outlet pipe.

Attachment 4

South River Conduit CCTV Inspection Photos

Photos provided for general reference to identify the approximate size of collapsed connections to the South River Conduit to be repaired. Contractor to complete additional inspections and measurements, including confined space entry if required to determine the exact location and extent of each connection to be plugged and or repaired.

Collapsed Drain Connection to South River Conduit (#1)

(Very approximate location = 195-feet downstream from access manhole)



Collapsed Drain Connection to South River Conduit (#2)

(Very approximate location = 220-feet downstream from access manhole)



Attachment 5

CCTV Inspection Logs

Logs provided for reference to provide approximate location of connections to interceptor sewer in parking lot and South River Conduit. Contractor to complete additional investigations and measurements to determine exact location if required.

Tabular Report of PSR SMH 259 A for NECE

Setup 10 Surveyor MRG Certificate # U-412-15081 System Owner

Drainage	Survey Customer NECE				
P/O #	Date 2015/03/06	Time 9:47	Street Washington St.		
City Salem	Further location details				
Start SMH 259	Rim to invert	Grade to invert	Rim to grade	Ft	
Finish SMH 254	Rim to invert	Grade to invert	Rim to grade	Ft	
Use	Direction Down	Flow control	Media No		
Shape Circular	Height 42	Width ins	Preclean N	Year Cleaned	
Material Reinforced Concrete Pipe	Joint length	Ft	Total length	Ft	Length Surveyed 105.4
Lining	Year laid	Year rehabilitated	Weather		
Purpose	Cat	Pressure			
Additional info			Structural	O&M	Constructional
Location			Miscellaneous	Hydraulic	
Project Mass Works	Work Order				
Northing	Easting	Elevation			
Coordinate System	GPS Accuracy				

Count	Video	CD	Code	In1	In2	%	JntFr	To	ImRef	Remarks
0.0			ST Start of Survey							
0.0			AMH Manhole							SMH 259
0.0			MWL Water Level			50				
48.1			TBC Tap Break-in Capped	6.000			12			
104.7			TB Tap Break-in	6.000			01			
105.4			MSA Abandoned Survey							debris

105.4 Ft Total Length Surveyed

Scores

Structural:	Pipe Rating 0	Pipe Ratings Index 0	Peak 0	Mean Pipe 0
O&M:	Pipe Rating 2	Pipe Ratings Index 1	Peak 2	Mean Pipe 0

Tabular Report of PSR 1308

A for NECE

Setup 5 Surveyor MRG Certificate # U-412-15081 System Owner

Drainage	Survey Customer NECE				
P/O #	Date 2015/03/05	Time 11:18	Street Canal St		
City Salem	Further location details S MH at corner of Canal and Mill				
Start 1307	Rim to invert	Grade to invert	Rim to grade	Ft	
Finish 1308	Rim to invert	Grade to invert	Rim to grade	Ft	
Use	Direction Up	Flow control	Media No		
Shape Circular	Height 14.2	Width ins	Preclean H	Year Cleaned 2015/03/05	
Material Reinforced Concrete Pipe	Joint length	Ft	Total length 39.3	Ft	Length Surveyed 39.3
Lining	Year laid	Year rehabilitated	Weather		
Purpose	Cat	Pressure			
Additional info			Structural	O&M	Constructional
Location			Miscellaneous	Hydraulic	
Project Mass Works			Work Order		
Northing		Easting	Elevation		
Coordinate System		GPS Accuracy			

Count	Video	CD Code	In1	In2	% JntFr	To	ImRef	Remarks
0.0		ST Start of Survey						
0.0		AMH Manhole						1307
0.0		MWL Water Level			60			
34.3		RPP Repair Patch				10		hard to tell whether defect o...
39.3		AMH Manhole						1308
39.3		FH End of Survey						

39.3 Ft Total Length Surveyed

Scores

Structural:	Pipe Rating 0	Pipe Ratings Index 0	Peak 0	Mean Pipe 0
O&M:	Pipe Rating 0	Pipe Ratings Index 0	Peak 0	Mean Pipe 0

Tabular Report of PSR DMH 6491 A for NECE

Setup 8 Surveyor MRG Certificate # U-412-15081 System Owner

Drainage	Survey Customer NECE				
P/O #	Date 2015/03/06	Time 8:22	Street Washington St.		
City Salem	Further location details				
Start DMH 6491	Rim to invert	Grade to invert	Rim to grade	Ft	
Finish DOWNSTREAM DMH 6491	Rim to invert	Grade to invert	Rim to grade	Ft	
Use	Direction Down	Flow control	Media No		
Shape Circular	Height 72	Width ins	Preclean N	Year Cleaned	
Material Reinforced Concrete Pipe	Joint length	Ft	Total length 369.5	Ft	Length Surveyed 369.5
Lining	Year laid	Year rehabilitated	Weather		
Purpose	Cat	Pressure			
Additional info			Structural O&M Constructional		
Location			Miscellaneous Hydraulic		
Project Mass Works			Work Order		
Northing		Easting	Elevation		
Coordinate System		GPS Accuracy			

Count	Video	CD	Code	In1	In2	%	JntFr	To	ImRef	Remarks
0.0			ST Start of Survey							
0.0			AMH Manhole							DMH 6491
0.0			MWL Water Level			20				
37.5			TB Tap Break-in	12.000			02			
182.9			OBP Obstacle External Pipe or Cable			5	12			
195.0			TF Tap Factory	48.000			03			
223.5			TF Tap Factory	48.000			03			
279.1			TB Tap Break-in	12.000			01			
369.5			AMH Manhole							DOWNSTREAM DMH 6491
369.5			FH End of Survey							dnh 6780

369.5 Ft Total Length Surveyed

Scores

Structural:	Pipe Rating 0	Pipe Ratings Index 0	Peak 0	Mean Pipe 0
O&M:	Pipe Rating 2	Pipe Ratings Index 0.7	Peak 2	Mean Pipe 0

Attachment 6

ADS Pipe and Fitting Details

Manufacturers information provided for general reference. Contractor responsible to coordinate with manufacture, and furnish all materials needed for installation, and follow manufacturer's installation requirements.

SANITARY PIPE

SANITITE® HP

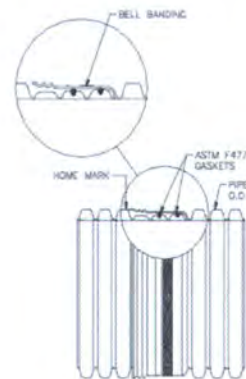
APPLICATIONS: A high-performance polypropylene pipe for use in gravity flow, wastewater conveyance, and high performance storm drain systems. Typically used in trunk/interceptor sanitary sewers to service treatment plant flow.

CHARACTERISTICS

PRODUCT	DESCRIPTION	DIAMETER	CONNECTIONS	SPECIFICATIONS/PERFORMANCE
SANITITE HP	Annular corrugations with smooth interior wall. 30"-60" Triple Wall has smooth exterior surface. Pipe is bell-and-spigot with the bell being reinforced with a polymer wrap and the spigot having two gaskets.	12"-30" (300-750 mm) Dual Wall	Bell-and-spigot with two rubber gaskets meeting ASTM F477.	12"-30" (300-750 mm) meets ASTM F2736. 12"-30" joints meet the requirements of ASTM F2736.
		30"-60" (750-1500 mm) Triple Wall		30"-60" (750-1500 mm) meets ASTM F2764. 30"-60" joints meet the requirements of ASTM F2764.

SANITITE HP

DIAMETER	LENGTH	STYLE	SANITITE HP
12" (300 mm)	13' (3.9 m)	Dual wall	1230 0013 IBPP
	20' (6.1 m)	Dual wall	1230 0020 IBPP
15" (375 mm)	13' (3.9 m)	Dual wall	1530 0013 IBPP
	20' (6.1 m)	Dual wall	1530 0020 IBPP
18" (450 mm)	13' (3.9 m)	Dual wall	1830 0013 IBPP
	20' (6.1 m)	Dual wall	1830 0020 IBPP
24" (600 mm)	13' (3.9 m)	Dual wall	2430 0013 IBPP
	20' (6.1 m)	Dual wall	2430 0020 IBPP
30" (750 mm)	13' (3.9 m)	Dual wall	3030 0013 IBPP
	20' (6.1 m)	Dual wall	3030 0020 IBPP
30" (750 mm)	13' (3.9 m)	Triple wall	3030 0013 IBHP
	20' (6.1 m)	Triple wall	3030 0020 IBHP
36" (900 mm)	13' (3.9 m)	Triple wall	3630 0013 IBHP
	20' (6.1 m)	Triple wall	3630 0020 IBHP
42" (1050 mm)	13' (3.9 m)	Triple wall	4230 0013 IBHP
	20' (6.1 m)	Triple wall	4230 0020 IBHP
48" (1200 mm)	13' (3.9 m)	Triple wall	4830 0013 IBHP
	20' (6.1 m)	Triple wall	4830 0020 IBHP
60" (1500 mm)	16' (3.9 m)	Triple wall	6030 0016 IBHP
	20' (6.1 m)	Triple wall	6030 0020 IBHP



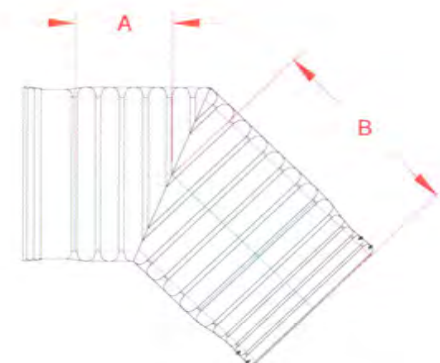
**SANITITE HP
DUAL WALL**



**SANITITE HP
TRIPLE WALL**

SANITITE® HP TRIPLE WALL FABRICATED 45° BENDS
30" - 60" DIAMETER (IB BELL\IB SPIGOT)

PART #	PIPE SIZE	A	B	JOINT
3097AN30BPT	30 in (750 mm)	18.6 in (472 mm)	32.9 in (837 mm)	WT
3697AN30BPT	36 in (900 mm)	22.0 in (558 mm)	45.4 in (1153 mm)	WT
4297AN30BPT	42 in (1050 mm)	19.8 in (504 mm)	32.1 in (814 mm)	WT
4897AN30BPT	48 in (1200 mm)	25.4 in (645 mm)	44.4 in (1128 mm)	WT
6097AN30BPT	60 in (1500 mm)	29.0 in (736 mm)	58.4 in (1483 mm)	WT



WT (INCLUDES 2 GASKETS)

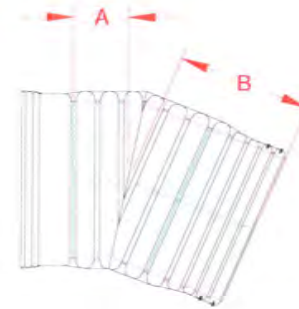
NOTE: ALL FITTINGS DIMENSIONS ARE FOR REFERENCE ONLY



DRAWING #:	HP 15650
DRAWN BY:	TJR 2/8/2010
APPROVED BY:	
REVISIONS:	TJR 8/8/2011

SANITITE® HP TRIPLE WALL FABRICATED 22.5° BENDS
30" - 60" DIAMETER (IB BELL\IB SPIGOT)

PART #	PIPE SIZE	A	B	JOINT
3092AN30BPT	30 in (750 mm)	10.9 in (276 mm)	25.2 in (640 mm)	WT
3692AN30BPT	36 in (900 mm)	12.1 in (308 mm)	30.3 in (769 mm)	WT
4292AN30BPT	42 in (1050 mm)	16.2 in (412 mm)	28.5 in (723 mm)	WT
4892AN30BPT	48 in (1200 mm)	14.4 in (366 mm)	33.4 in (848 mm)	WT
6092AN30BPT	60 in (1500 mm)	15.8 in (400 mm)	39.0 in (991 mm)	WT



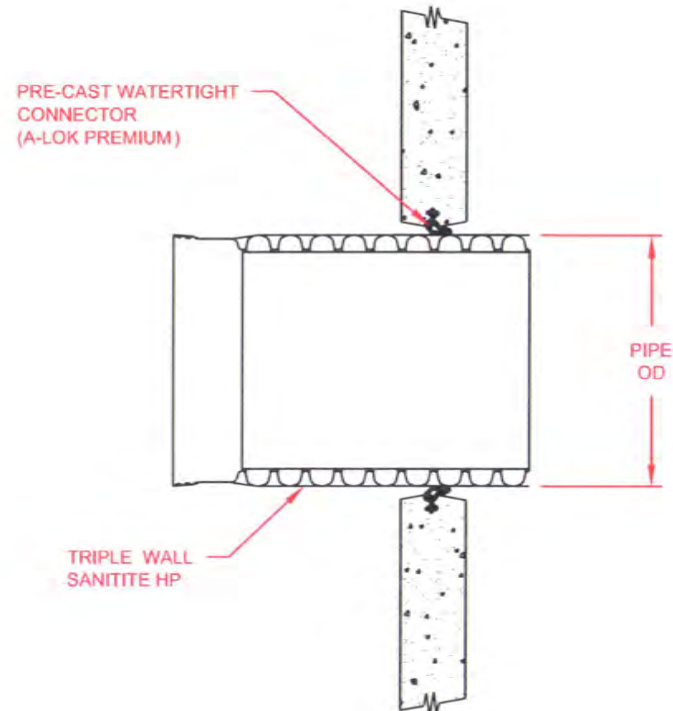
WT (INCLUDES 2 GASKETS)

NOTE: ALL FITTINGS DIMENSIONS ARE FOR REFERENCE ONLY



DRAWING #:	HP 15300	
DRAWN BY:	TJR	10/29/2009
APPROVED BY:		
REVISIONS:	TJR	8/8/2011

30"-60" TRIPLE WALL SANITITE® HP WATERTIGHT CONNECTION USING A PRE-CAST COMPRESSION GASKET



PIPE SIZE (IN)	PIPE OD (IN)	A-LOK® PREMIUM GASKET *
30	35.4	1130
36	41.1	1310
42	47.2	1500
48	53.8	1705
60	66.5	2070

* THIRD PARTY - CODES AS SUPPLIED BY MANUFACTURER
A-LOK is a registered trademark of A-LOK Products, Inc. (www.a-lok.com)

NOTES:

PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

SEE STANDARD DETAIL STD-201 AND TECHNICAL NOTE: 5.04 CONNECTIONS TO MANHOLES AND STRUCTURES FOR INSTALLATION RECOMMENDATIONS.

© 2010 ADS, INC.

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THIS DETAIL BASED ON INFORMATION PROVIDED TO ADS. THIS DRAWING IS INTENDED TO DEPICT THE COMPONENTS AS REQUESTED. ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN SERVICES FOR THIS PROJECT, NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS PROVIDED HEREIN ARE GENERAL RECOMMENDATIONS AND ARE NOT SPECIFIC FOR THIS PROJECT. THE DESIGN ENGINEER SHALL REVIEW THESE DETAILS PRIOR TO CONSTRUCTION. IT IS THE DESIGN ENGINEERS RESPONSIBILITY TO ENSURE THE DETAILS PROVIDED HEREIN MEETS OR EXCEEDS THE APPLICABLE NATIONAL, STATE, OR LOCAL REQUIREMENTS AND TO ENSURE THAT THE DETAILS PROVIDED HEREIN ARE ACCEPTABLE FOR THIS PROJECT.

4	UPDATED INFO. & REVISED GASKETS	TJR	10/11/13		
REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D	
WATERTIGHT STRUCTURE 30"-60" SANITARY DETAIL					
DRAWING NUMBER: STD-205B					
 4640 TRUEMAN BLVD HILLIARD, OHIO 43026 ADVANCED DRAINAGE SYSTEMS, INC.					
					DESIGNED BY: JAB DATE: 4/3/09 CHECKED BY: NTS SHEET: 1 OF 1



The Company with Connections®



CUSTOM MADE FIBERGLASS HOLDERS FOR CONNECTORS

FIELD SLEEVES For Curved or Flat Wall Structures

FIBERGLASS FIELD SLEEVES

An alternative method to cast a watertight connector into a concrete structure. They can be used in the plant or poured in place in the field. Each field sleeve is custom built to fit a particular structure that will fit any size of our connectors.



CONNECTORS

Our field sleeves can be used with the following connectors:

- A-LOK STM
- Z-LOK
- Z-LOK STM
- Premium
- X-CEL
- Quik-LOK
- Septic Seals



Curved Wall Field Sleeve
With A-LOK XCEL Connector



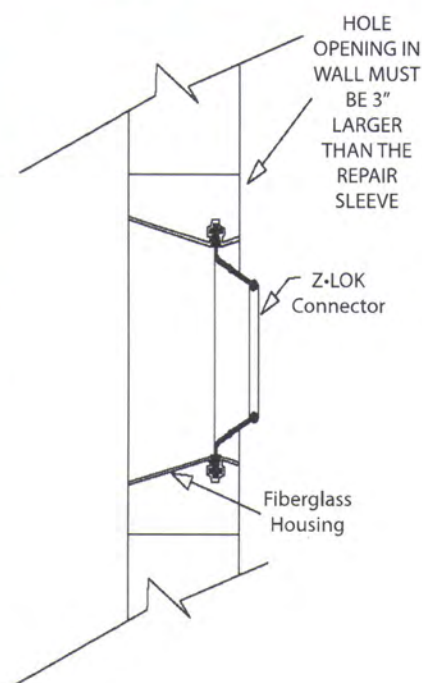
Z-LOK Mounted in Field Sleeve



Flat Wall Field Sleeve
With A-LOK STM Connector

FIELD SLEEVE INSTALLATION

Into an Opening in an Existing
Round or Flat Wall Structure



Step 1.

Check X-CEL or Z-LOK i A-LOK Field Sleeve an pipe O.D. to make sure the are correct.

Step 2.

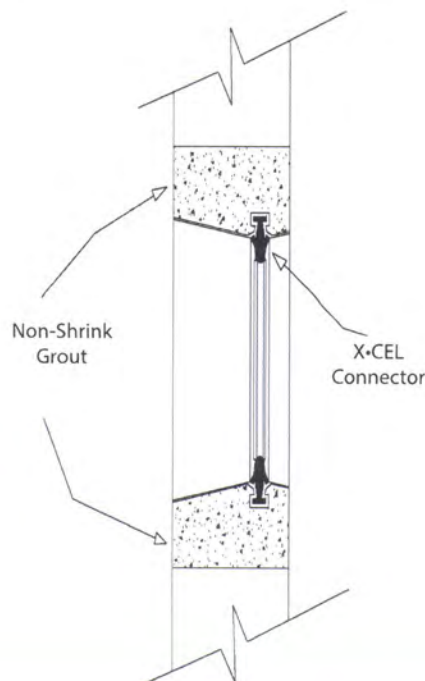
Make a perimeter, on th structure, three (3) inch larger than the outsid diameter of the A-LOK Fiel Sleeve.

Step 3.

On this perimeter either:
a.) Core the entire openin to create a hole.
b.) Drill a series of one (1 inch or larger holes n more than 5 inches apa so a jackhammer can b used to create an openin for the Field Sleeve.

Step 4.

Set up A-LOK Field Sleev in opening on correc grade. Pack annular spac between opening an outside diameter of fiel sleeve firmly with non-shr grout. Carefully follow gro manufacturer's instructio for mixing, placing and curing.

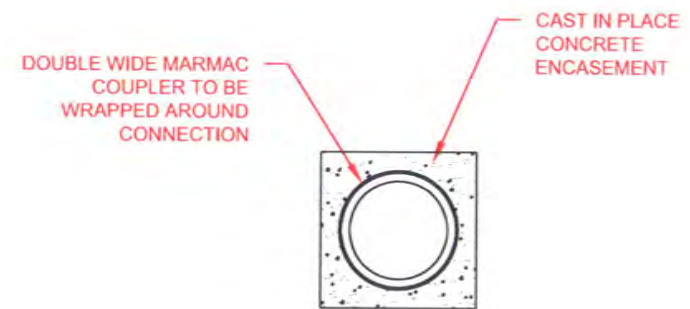
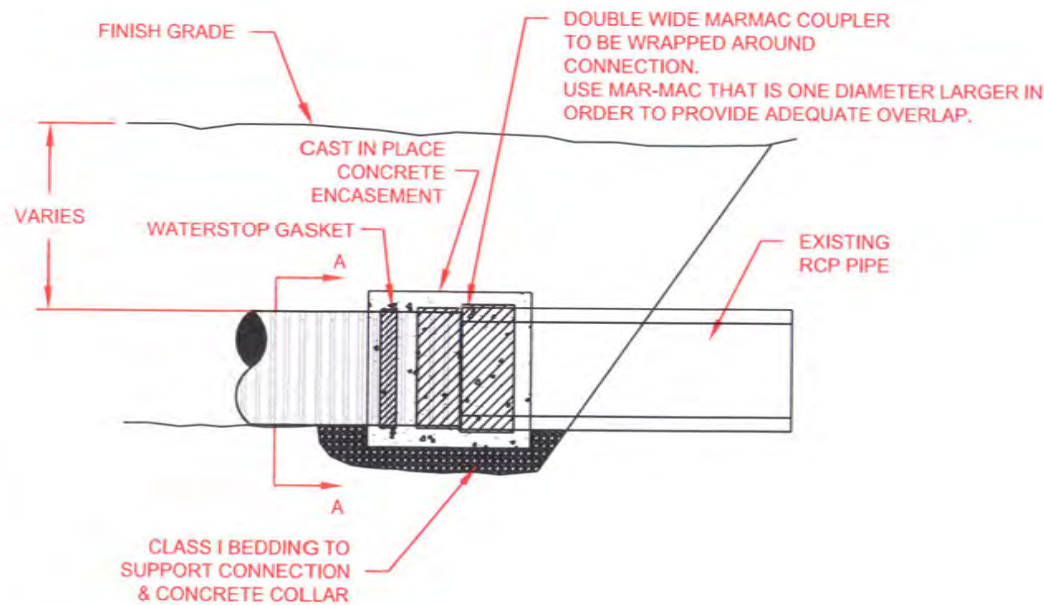
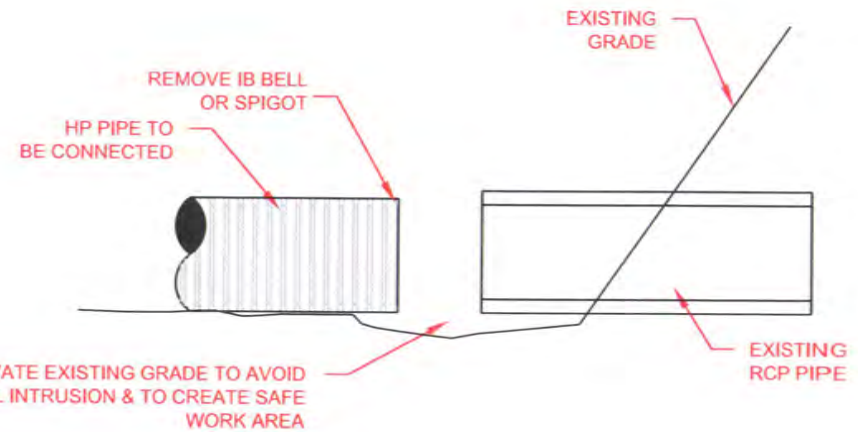


Step 5.

Once grout is cured review Pipe Installatio Instructions for Z-LOK o X-CEL Connectors on sid 2 of these instructions.

NOTES:

1. CONNECTION AND PIPE TO BE BACKFILLED PER ASTM D2321, LATEST EDITION.
2. AN INTERNAL CYLINDER MAY BE WELDED TO THE PIPE TO BE INSERTED INTO THE ID OF THE EXISTING PIPE AND MINIMIZE JOINT MOVEMENT. HOWEVER, AN INTERNAL CYLINDER IS NOT RECOMMENDED FOR DOWNSTREAM CONNECTIONS.



© 2010 ADS, INC.

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THIS DETAIL BASED ON INFORMATION PROVIDED TO ADS. THIS DRAWING IS INTENDED TO DEPICT THE COMPONENTS AS REQUESTED. ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN SERVICES FOR THIS PROJECT, NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS PROVIDED HEREIN ARE GENERAL RECOMMENDATIONS AND ARE NOT SPECIFIC FOR THIS PROJECT. THE DESIGN ENGINEER SHALL REVIEW THESE DETAILS PRIOR TO CONSTRUCTION. IT IS THE DESIGN ENGINEERS RESPONSIBILITY TO ENSURE THE DETAILS PROVIDED HEREIN MEETS OR EXCEEDS THE APPLICABLE NATIONAL, STATE, OR LOCAL REQUIREMENTS AND TO ENSURE THAT THE DETAILS PROVIDED HEREIN ARE ACCEPTABLE FOR THIS PROJECT.

REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D	DATE	DRW'N	SHEET
					6/10/11	CKM	1 OF 1
SANITITE HP TO RCP CONNECTION DETAIL (MARMAC)					ADS 4640 TRUEMAN BLVD HILLIARD, OHIO 43026 ADVANCED DRAINAGE SYSTEMS, INC.		
DRAWING NUMBER: CUSTOM					NTS		

MAR MAC® POLYSEAL REPAIR COUPLER SPECIFICATION

Scope

The Mar Mac Polyseal Repair Coupler is a connection for 8- through 60-inch (200 to 1500 mm) ADS N-12 pipe.

Material Properties

The Mar Mac Coupler, as manufactured by Mar Mac® Construction Products, Inc. and distributed by ADS, Inc., consists of a mastic adhesive base layer, a cross-laminated polyethylene middle layer and a spun-bonded geotextile polypropylene cloth outer layer.

Installation

Installation shall be in accordance with Mar Mac Construction Products, Inc. recommended installation instructions. Polyseal repair coupler, in conjunction with corrugated HDPE pipe, is considered a soil-tight connection unless otherwise approved by local governing body.



Nominal Pipe Diameter, in. (mm)	Strap Length (S) in. (mm)	Standard		Double Wide	
		Length (L) in. (mm)	Width (W) in. (mm)	Length (L) in. (mm)	Width (W) in. (mm)
8 (200)	40 (1016)	35 (889)	4 (101)	n/a	n/a
10 (250)	40 (1016)	42 (1067)	6 (152)	n/a	n/a
12 (300)	50 (1270)	52 (1321)	7 (178)	52 (1321)	12 (305)
15 (375)	58 (1473)	62 (1575)	10 (254)	62 (1575)	14 (355)
18 (450)	71 (1803)	75 (1905)	10 (254)	75 (1905)	16 (406)
24 (600)	93 (2362)	94 (2387)	12 (305)	94 (2387)	20 (508)
30 (750)	125 (3175)	125 (3175)	15 (381)	125 (3175)	24 (609)
36 (900)	141 (3581)	141 (3581)	18 (457)	141 (3581)	30 (762)
42 (1050)	161 (4089)	161 (4089)	20 (508)	161 (4089)	30 (762)
48 (1200)	183 (4648)	183 (4648)	20 (508)	183 (4648)	32 (813)
60 (1500)	219 (5562)	222 (5639)	28 (711)	222 (5639)	46 (1168)

4", 6" and 54" standard couplers may be available by special order. Contact an ADS representative.

SANITITE® HP TRIPLE WALL
30" -60" JOINT PUSHER

PART #	PIPE SIZE
3008ANPT	30 in (750 mm)
3608ANPT	36 in (900 mm)
4208ANPT	42 in (1050 mm)
4808ANPT	48 in (1200 mm)
6008ANPT	60 in (1500 mm)



NOTE:
REQUIRES SERIES 65 GASKET (INCLUDED)
IN FIELD TO MAKE WT CONNECTION

NOTE: ALL DIMENSIONS ARE NOMINAL



DRAWING #:	HP 19200
DRAWN BY:	TJR 2/10/2010
APPROVED BY:	
REVISIONS:	TJR 11/19/2010

Attachment 7

NGrid Email Correspondence

Excerpts from July 2015 email conversation with NGrid regarding procedures to work around high voltage, direct bury electric NGrid cables in Salem, MA. Photo provided by NGrid to show recent construction around high voltage direct bury cables and installation of new NGrid conduit duct banks in Salem, MA. (cables de-energized in photo).

Questions and responses from NECE and NGrid relating to work around high voltage-direct bury cables.

NECE: You have an outage scheduled for 9/15 to 9/19/2015. Is this still accurate?

NGrid: Outage is from 9-14 to 09-19

NECE: We would also like to clarify the limits on working near the cables live in our specifications.

NGrid: We cannot stop 3rd party from installing facilities around our cable, notification of work should be done to grid.

NECE: Please let us know if there are standards for excavation adjacent to or parallel with the cables, to what separation can we excavate?

NGrid: We have no standards for excavating around our cables.

NECE: For example, contractor can excavate within 20-feet of cables without notification to NGrid and within 10-feet of cables with notification to NGrid and NGrid staff onsite.

NGrid: No notification needed with 10 feet or more as a good practice. If cable (three phases) is to be undermined, cap removal is necessary to prevent mechanical damage to cables from cap collapsing and bearing hard on cables. Pictures attached for reference.

NECE: Can excavation above cables to expose concrete cap be completed live?

NGrid: Your contractor can excavate to the cap live. Cap should be removed by National Grid contractor or with national grid oversight. Hand tools only (Sledge hammers to break cap) NO chipping guns NO jackhammers!!!

NECE: Who would be the contact person/department/number that we should have Contractor call at NGrid to coordinate work as described above?

NGrid: The first line of contact should be our civil construction supervisor BG Chabot (508) 631-1744

Questions and responses from NECE and NGrid relating to installation of new NGrid electric distribution conduits and manholes.

NECE: Please confirm if contractor would need to be (or have) a licensed electrician on staff to install the empty ducts, if electric permit would be required, and if NGrid would require inspection prior to backfill.

NGrid: We do not require a licensed electrician on staff for conduit installation. We have trench inspectors that would be assigned to their job to witness manhole and conduit installation, and backfill.

