Copy No. _____

LOWELL REGIONAL WASTEWATER UTILITY
CITY OF LOWELL, MASSACHUSETTS

CONTRACT AND SPECIFICATIONS
FOR
CSO SEWER SEPARATION PROGRAM

MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

APRIL 2016

LOWELL CITY MANAGER

Kevin J. Murphy

LOWELL CITY COUNCILORS

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John J. Leahy
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LOWELL REGIONAL WASTEWATER UTILITY

Mark Young, Executive Director
Michael Stuer, Engineering Manager

CDM Smith Inc.
Consulting Engineers
Manchester, New Hampshire

LOWELL REGIONAL WASTEWATER UTILITY
CITY OF LOWELL, MASSACHUSETTS
CSO SEWER SEPARATION PROGRAM

MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241/IFB 16-89
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Bidding and Contract Requirements

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SEWER SEPARATION PROGRAM

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INVITATION TO BID

Sealed Bids for construction of the Marginal Sewer Relief Pipe (Part A) and LRTA Drainage Improvements (Part B) project must be received at the Office of the Lowell City Hall Purchasing Department, 375 Merrimack Street, Room 60, Lowell, Massachusetts, 01852 by Wednesday**, May 11, 2016 at 11:00 AM ET**. At that time and place, submitted bids will be publicly opened and read aloud.

The work includes furnishing and installing approximately 650 linear feet of 24-inch diameter Class IV and V RCP sewer pipe, 130 linear feet of steel casing pipe jacked under existing railroad tracks, and a flow control/stop log pre-cast concrete structure; water main relocations, manholes, dog house manhole and precast connection structure, 230 linear feet of 60-inch diameter Class IV RCP drain pipe, 400 LF of 42-inch drain culvert cleaning, dewatering and drainage, and pipe connections, earthwork, paving, restoration, and all miscellaneous work and cleanup as required to complete the work.

A **Mandatory Pre-Bid Conference** to discuss the requirements of the Contract Documents will be held at the Lowell (Duck Island) Regional Wastewater Utility, First Street Boulevard, Route 110, Lowell, MA 01850 on Wednesday, May 4, 2016 at 11:00 AM ET.

The Contract Time shall be 520 Calendar Days commencing on the Effective Date of the Agreement. The Part A work, all of the Marginal Sewer Relief Pipe including final paving, must be completed by August 19, 2016 in accordance with the terms of a temporary construction easement. The temporary construction easement provides the Bidder with a temporary construction staging and materials storage area for Part A work up until August 19, 2016, when it must be vacated and fully restored.

Bidding Documents may be obtained after 10:00 AM ET on Wednesday, April 27, 2016 from the City of Lowell website at http://www.lowellma.gov/purchasing. Bidding Documents can be found by clicking on "Open Solicitations" under the "Department Facts" header. Bid Documents may also be examined at the Office of the Purchasing Agent, City Hall, 375 Merrimack Street, Lowell, MA [Phone (978) 970 4110].

Complete sets of Bidding Documents shall be used in preparing bids. The Owner and Engineer do not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents or for modifications to the Bidding Documents including electronic conversion.

Each Bid shall be submitted in accordance with the Instructions to Bidders and shall be accompanied by a **Bid Security in the amount of 5 percent of the Bid**.

Bidders may not withdraw their Bids for a period of thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids.

The Successful Bidder must furnish a **100 percent Performance Bond and a 100 percent Payment Bond** with a surety company acceptable to the Owner.

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

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The two low bidders agree to submit a qualifications package for the pipe jacking contractor (as identified in Section 02340) within two days of the bid opening. Failure to comply with the requirements of this paragraph may be deemed to render a proposal non-responsive.

Wage rates for this Project are subject to the minimum wage rates as per M.G.L., Chapter 149, Section 26 to 27H inclusive.

The bidding and award of this Contract will be under the provisions of M.G.L. Chapter 30, Section 39M.

The Owner reserves the right to waive any informality in or to reject any or all Bids if deemed to be in its best interest.

The City of Lowell, acting through its Executive Director of the Lowell Regional Wastewater Utility, reserves the right to waive any informality in, to reject any or all bids, or to accept the one which appears in the best interest of the City of Lowell.

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SEWER SEPARATION PROGRAM

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INSTRUCTIONS TO BIDDERS

ARTICLE 1. QUALIFICATIONS OF BIDDERS

1.1 Bidders may be investigated by OWNER to determine if they are qualified to perform the Work. All Bidders shall be prepared to submit within five days of OWNER's or ENGINEER's request, written evidence of such information and data necessary to make this determination.

1.2 The Bidder shall name the pipe jacking specialty contractor to perform the Work in the Bid Form. If the Bidder is deemed one of the two low bidders, the Bidder shall submit the qualifications of the pipe jacking contractor, in accordance with Section 02340, within two days of the bid opening.

1.3 The investigation of a Bidder will seek to determine whether the organization is adequate in size, is authorized to do business in the jurisdiction where the project is located, has had previous experience and whether available equipment and financial resources are adequate to assure OWNER that the Work will be completed in accordance with the terms of the Agreement. The amount of other work to which the Bidder is committed may also be considered.

1.4 In evaluating Bids, OWNER will consider the qualifications of only those Bidders whose Bids are in compliance with the prescribed requirements.

1.5 OWNER reserves the right to reject any Bid if the evidence submitted by, or the investigation of, such Bidder fails to satisfy OWNER that such Bidder is properly qualified to carry out the obligations of the Contract Documents and to complete the Work contemplated therein.

ARTICLE 2. COPIES OF CONTRACT DOCUMENTS

2.1 Complete sets of Contract Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

ARTICLE 3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

3.1 Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may in any manner affect cost, progress or performance of the Work, (c) become familiar with Federal, State and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work; and (d) study and carefully correlate Bidder's observations with the requirements of the Contract Documents.

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3.2 Boring locations are indicated in Plan views on the Drawings. The boring logs are included in Appendices to the Project Manual. Soil samples may be examined at the Engineer's office during regular business hours. These boring logs are not part of the Contract Documents.

3.3 Surveys and investigative reports of subsurface or latent physical conditions at the site which have been relied upon by ENGINEER in preparing the Contract Documents are identified in Article 4 of the Supplementary Conditions. Copies of these reports are included in the Appendix to the Project Manual. These reports are not guaranteed or warranted as to accuracy or completeness, nor are they part of the Contract Documents.

3.4 Before submitting a Bid, Bidders may, at their own expense, make such additional investigations and tests as they may deem necessary to determine their Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

3.5 On request, OWNER will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for the submission of a Bid.

3.6 The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Supplementary Conditions, General Requirements or on the Drawings.

3.7 The submission of a Bid will constitute an incontrovertible representation that the Bidder has complied with every requirement of this Article 3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 4. INTERPRETATIONS

4.1 **Any request for clarification to, or relief from, the specifications, must be submitted in writing by May 5, 2016 to P. Michael Vaughn, Chief Procurement Officer/Purchasing Agent, City of Lowell, 375 Merrimack Street, Lowell MA 01852 or by Email pmvaughn@lowellma.gov.**

4.2 Written clarifications or interpretations will be issued by Addenda not later than two days before the bid opening date. Only questions answered by formal written Addenda will be binding. Oral and other clarifications or interpretations will be without legal effect. Addenda will be posted on the city of Lowell's Purchasing Department website. Bidders are required to review all bidding materials on the website and acknowledge all issued Addenda on the Bid Form. As a courtesy, the Addenda will also be emailed to all attendees providing email addresses at the Mandatory Pre-Bid Meeting.

4.3 Bidders are responsible for determining that they have received all Addenda issued.

ARTICLE 5. MANDATORY PRE-BID CONFERENCE

5.1 **A Mandatory Pre-Bid Conference will be held at Lowell (Duck Island) Regional Wastewater Facility, First Street Boulevard, Route 110, Lowell, MA 01850 on Wednesday, May 4, 2016 at 11:00 AM ET to discuss the requirements of the Contract Documents and answer any questions prospective bidders may have regarding this project.**

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ARTICLE 6. BID SECURITY

6.1 Each Bid must be accompanied by cash, bid bond, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to OWNER. The Bid Security shall be in the amount stated in the Invitation to Bid. Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid. All Bid Securities except those of the three lowest responsible and eligible Bidders will be returned within five days, Saturdays, Sundays, and legal holidays excluded, after opening of the Bids. All Bid Securities will be returned on the execution of the Agreement or if no award is made, within thirty days, excluding Saturdays, Sundays and legal holidays after the actual date of opening of the Bids, unless forfeited under the conditions herein stipulated.

6.2 In case a party to whom a Contract is awarded shall fail or neglect to execute the Agreement and furnish the satisfactory bonds within the time specified, OWNER may determine that the Bidder has abandoned the Contract, and thereupon the Bid Forms and acceptance shall be null and void and the Bid Security accompanying the Bid Form shall be forfeited to OWNER as liquidated damages for such failure or neglect and to indemnify said OWNER for any loss which may be sustained by failure of the Bidder to execute the Agreement and furnish the bonds as aforesaid, provided that the amount forfeited to OWNER shall not exceed the difference between the Bid Price of said Bidder and that of the next lowest responsible and eligible bidder and provided further that, in case of death, disability, or other unforeseen circumstances affecting the Bidder, such Bid Security may be returned to the Bidder. After execution of the Agreement and acceptance of the bonds by OWNER, the Bid Security accompanying the Bid Form of the Successful Bidder will be returned.

ARTICLE 7. PERFORMANCE, PAYMENT AND OTHER BONDS

7.1 Performance, Payment and other Bonds shall be provided in accordance with Article 5 of the Conditions of the Contract.

7.2 All Bonds required as Contract Security shall be furnished with the executed Agreement.

ARTICLE 8. BID FORM

8.1 Each Bid shall be submitted on the Bid Form on the perforated pages appended to the Project Manual. The Bid Form shall be removed and submitted separately. All blank spaces for Bid prices must be filled in with the unit price for the item or the lump sum for which the Bid is made.

8.2 Bid Forms shall be completed in ink or by typewriter. The Bid price of each item on the form shall be stated in words, and figures. If unit prices are required on the Bid Form, discrepancies between unit prices and their respective total amounts will be resolved in favor of the unit prices. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

8.3 **The Bidder shall name the pipe jacking specialty contractor to perform the Work in the Bid Form. If the Bidder is deemed one of the two low bidders, the Bidder shall submit the qualifications of the pipe jacking contractor, in accordance with Section 02340, within two days of the bid opening.**

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8.4 Bids by corporations shall be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

8.5 Bids by Limited Liability Companies shall be executed in the Limited Liability name by the Manager (or other Limited Liability Company officer/representative accompanied by evidence of authority to sign.) The Limited Liability Company address and state where the Limited Liability Company was formed shall be shown below the signature.

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

8.7 All names shall be typed or printed below the signature.

8.8 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

8.9 The address to which communications regarding the Bid are to be directed shall be shown.

8.10 The Bidder shall attach a completed City of Lowell Certificate of Compliance to the Bid Form.

8.11 One copy of each Bid shall be submitted in a sealed opaque envelope bearing on the outside the Bidder's name, address, and the Project Title for which the Bid is submitted. (If forwarded by mail, Bid and sealed envelope marked as described above shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face and addressed as indicated in the Invitation to Bid.) The Bid Security shall be submitted in a separate envelope from the Bid and attached to the envelope containing the Bid.

ARTICLE 9. RECEIPT OF BIDS

9.1 Sealed Bids for the work of this Contract will be received at the time and place indicated in the Invitation to Bid.

9.2 OWNER may consider informal any Bid not prepared and submitted in accordance with the provisions hereof.

9.3 Bidders are cautioned that it is the responsibility of each individual bidder to assure that their bid is in the possession of the responsible official or the 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.

ARTICLE 10. MODIFICATION AND WITHDRAWAL OF BIDS

10.1 Bids may be modified only by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

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10.2 Bids may be withdrawn prior to the scheduled time (or authorized postponement thereof) for the opening of Bids.

10.3 Any Bid received after the time and date specified shall not be considered. No Bid may be withdrawn for a period of thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids.

ARTICLE 11. AWARD OF CONTRACT

11.1 The Contract will be awarded to the lowest responsible and eligible Bidder (Successful Bidder). Such a Bidder shall possess the skill, ability, and integrity necessary for the faithful performance of the work. The term "lowest responsible and eligible Bidder" as used herein shall mean the Bidder whose Bid is the lowest of those Bidders possessing the skill, ability and integrity necessary to the faithful performance of the Work.

11.2 The basis of award shall be on the Total Bid Price of both Part A and Part B. **The OWNER intends to award the Bidder both Part A and Part B of this contract. However, the Bidder acknowledges that the OWNER will execute one contract but issue separate a Notice to Proceed for each Part (Part A and Part B). A Notice to Proceed for Part B is subject to the OWNER's acquisition of property rights to complete the project work in Part B. The OWNER expects to obtain these rights within 120 days of the execution of this Agreement. The Bidder, by submission of its bid holds the OWNER harmless of any and all claims for financial compensation or restitution if Part B is not awarded and a Notice to Proceed is not issued within 120 days of the execution of the Agreement. This contract language will be in the Agreement between the OWNER and the Bidder.**

11.3 OWNER reserves the right to reject any and all Bids, to waive any and all informalities if it is in Owner's best interest to do so, and the right to disregard all nonconforming, non-responsive or conditional Bids.

11.4 A Bid which includes for any item a Bid Price that is abnormally low or high may be rejected as unbalanced.

11.5 OWNER also reserves the right to reject the Bid of any Bidder that OWNER considers to be unqualified relative to Article 1 above.

11.6 If the Contract is to be awarded, OWNER will give the Successful Bidder a Notice of Award within thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids. All bids shall remain open for thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids but OWNER may, at OWNER's sole discretion, release any Bid and return the Bid Security prior to that date. **It is the Owners intent to issue the notice of award by June 1st, 2016.**

ARTICLE 12. EXECUTION OF AGREEMENT

12.1 When OWNER gives a Notice of Award to the Successful Bidder, it will be accompanied by at least six unsigned copies of the City Standard Agreement (See Appendix C) and all other applicable Contract Documents. Within three days after the date of receipt of such notification

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CONTRACTOR shall execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. Within ten days, thereafter OWNER will deliver one fully signed copy to CONTRACTOR.

ARTICLE 13. SAFETY AND HEALTH REGULATIONS

13.1 This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et seq.). Contractors shall be familiar with the requirements of these regulations.

13.2 The Successful Bidder shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).

13.3 The Successful Bidder shall have a competent person or persons, as required under the Occupational Safety and Health Act on the Site to inspect the Work and to supervise the conformance of the Work with the regulations of the Act.

ARTICLE 18. SALES TAX

18.1 The material and supplies to be used in the Work will be subject to the requirements of Paragraph 6.10 of the Conditions of the Contract.

ARTICLE 19. UTILITY UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

19.1 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 20. WAGE RATES

20.1 Minimum Wage Rates as determined by the Commissioner of Department of Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27D, as amended, apply to this project. It is the responsibility of the Contractor, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those tradespeople who may be employed for the proposed work under this Contract.

20.2 State schedules of minimum wage rates are included in Part II of the Supplementary Conditions.

ARTICLE 21. COMPETITIVE BIDDING

21.1 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.

ARTICLE 22. PRICE ADJUSTMENTS

22.1 Due to the uncertainty of prices for certain materials (liquid asphalt, Portland cement, diesel fuel and gasoline) price adjustments will be in accordance with Appendix H (of the MADEP Division

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of Municipal Services Plans and Specifications Checklist package), which is included in Part 2 of the Supplementary Conditions. The base price for each material shall be the period price in effect at the time the project is advertised. 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. Period prices can be found at the Massachusetts Department of Transportation (MassDOT) website at

http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/Construction/PriceAdjustments.aspx

END OF SECTION

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SEWER SEPARATION PROGRAM

MARGINAL SEWER RELIEF PIPE AND LRTA DRAINAGE IMPROVEMENTS
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The undersigned declares that the only persons or parties interested in this Bid as principals are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that he has carefully examined all the Contract Documents as prepared by CDM Smith, 670 North Commercial Street, Suite 208, Manchester, NH 03101 and dated April 2016; that they have informed themselves fully in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid Form is a part.

The time period for holding bids, where Federal approval is not required is 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids and where Federal approval is required, the time period for holding bids is 30 days, Saturdays, Sundays and holidays excluded after Federal approval.

The Bid Security accompanying this Bid shall be in the amount of 5 percent of the Bid. The Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid.

If a Notice of Award accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents is delivered to the undersigned within thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. The premiums for all Bonds required shall be paid by CONTRACTOR and shall be included in the Contract Price. The undersigned further agrees that the Bid Security accompanying this Bid shall become the property of OWNER if the Bidder fails to execute the Agreement as stated above.

The undersigned hereby agrees that the Contract Time shall be 520 calendar days, commencing on the effective date of the Agreement. The undersigned hereby agrees that the Part A work on the Marginal Sewer Relief Pipe (including restoration of all areas in Part A, final paving on all city streets, UML South Campus Parking Lot, and the DPW yard) must be completed by August 19, 2016, in order for the OWNER to meet the requirements of the temporary construction easement granted by the private property owner and to restore full functional use of the DPW yard to the city by that date.

The undersigned hereby agrees that the OWNER intends to award the Bidder both Part A and Part B of this contract. The undersigned also acknowledges that the OWNER will execute one contract but issue separate a Notice to Proceed for each Part (Part A and Part B). A Notice to Proceed for Part B is subject to the OWNER's acquisition of property rights to complete the project work in Part B. The OWNER expects to obtain these rights within 120 days of the execution of this Agreement. The Bidder, by submission of its bid holds the OWNER harmless of any and all claims for financial compensation or restitution if Part B is not awarded and a Notice to Proceed is not issued within 120 days of the execution of the Agreement. This contract language will be in the Agreement between the OWNER and the Bidder.

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If the Undersigned fails to execute all work associated with Part A - Marginal Sewer Relief Pipe successfully, and to the satisfaction of the Owner and Engineer, by August 19, 2016, the Undersigned agrees to pay Owner liquidated damages of $2,500.00 per day for each day beyond date of August 19, 2016, or extension thereof that the Work remains incomplete.

The undersigned further agrees to pay OWNER, as liquidated damages, $1,500.00 per day for each calendar day beyond 520 Calendar Days or extension thereof that the Part B Work remains incomplete, in accordance with the terms of the Agreement.

The undersigned acknowledges receipt of addenda numbered:

Addendum No.	***Date***	***Acknowledgement***

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the Work in its entirety in the manner and under the conditions required at the prices listed as follows:

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
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BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.1a	525 lin. ft.	Furnish and install 24-inch RCP sewer pipe including earth excavation and backfill; All Depths		
		_____ per linear foot	$ _____	$ _____
A.2a		*These items not used in Part A*		
A.3a	80 lin. ft.	Furnish and install 8-inch restrained joint Class 52 cement-lined ductile iron water pipe including excavation and backfill; All Depths		
		_____ per linear foot	$ _____	$ _____
A.3b	280 pounds	Furnish and install cement lined ductile iron restrained joint fittings, couplings, and caps for 4-inch thru 8-inch diameter ductile iron pipe		
		_____ per pound	$ _____	$ _____
A.4a	25 vert. ft.	Furnish and install 4-foot diameter precast concrete sewer manholes		
		_____ per vertical foot	$ _____	$ _____
A.4b	30 vert. ft.	Furnish and install 5-foot diameter precast concrete sewer manholes		
		_____ per vertical foot	$ _____	$ _____
A.4c	L.S.	Furnish and install 6-foot diameter precast concrete doghouse sewer manhole		
		_____ lump sum		$ _____

Subtotal Bid Page 00300-3 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.5	30 cu. yds.	Test Pits per cubic yard	$	$
A.6a	375 cu. yds.	Rock and Boulder Excavation Fixed Bid per cubic yard	$ 110.00	$41,250.00
A.6b	375 cu. yds.	Rock and Boulder Excavation Additional Bid per cubic yard	$	$
A.7	25 cu. yds.	Earth excavation below normal grade per cubic yard	$	$
A.8a	1,670 cu. yds.	Bank-run gravel per cubic yard	$	$
A.8b	25 cu. yds.	Screened gravel per cubic yard	$	$
A.8c	30 cu. yds.	Crushed stone for utility crossings and miscellaneous purposes per cubic yard	$	$

Subtotal Bid Page 00300-4 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.8d	25 cu. yds.	Common fill _____ per cubic yard	$ _____	$ _____
A.8e	35 cu. yds.	Sand for utility crossings and and miscellaneous purposes _____ per cubic yard	$ _____	$ _____
A.9	L.S.	Dewatering and Drainage _____ lump sum		$ _____
A.10a	25 cu. yds.	Miscellaneous Concrete _____ per cubic yard	$ _____	$ _____
A.10b	25 cu. yds.	Controlled Density Fill _____ per cubic yard	$ _____	$ _____
A.11a	810 sq. yds.	Furnish and install temporary trench width bituminous pavement (Binder; 3.5-inch thick) _____ per square yard	$ _____	$ _____
A.11b	4,620 sq. yds.	Furnish and install final trench width bituminous pavement (2-inch Binder; 1.5-inch Top) _____ per square yard	$ _____	$ _____

Subtotal Bid Page 00300-5 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.11c	6,560 sq. yds.	Cold plane (grind) full width pavement on streets/parking lots _____ per square yard	$ _____	$ _____
A.11d	6,560 sq. yds.	Furnish and install final full-width 1.5-inch overlay pavement (Top Course 1.5-inch thick) _____ per square yard	$ _____	$ _____
A.12	20 hrs.	Provide industrial street sweeper and operator _____ per hour	$ _____	$ _____
A.13a	470 tons	Removal and disposal of contaminated soil to an in-state unlined landfill _____ per ton	$ _____	$ _____
A.13b	160 tons	Removal and disposal of contaminated soil to a lined landfill _____ per ton	$ _____	$ _____
A.13c	20 tons	Removal and disposal of contaminated soil as RCRA hazardous waste _____ per ton	$ _____	$ _____

Subtotal Bid Page 00300-6 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.13d	20 tons	Removal and disposal of contaminated soil as asbestos containing waste		
		_____ per ton	$ _____	$ _____
A.14	L.S.	Railroad Inspection Services/Flagman and Fees		
		Eighteen Thousand Dollars lump sum (FIXED)		$ 18,000.00
A.15	L.S.	Pipe jacking under railroad property		
		_____ lump sum		$ _____
A.16	L.S.	Furnish and install precast Marginal Sewer Relief Control Structure including all interior components and connections		
		_____ lump sum		$ _____
A.17 thur A.21		*These items not used in Part A*		
A.22	L.S.	Miscellaneous Work and Cleanup - Part A		
		_____ lump sum		$ _____
A.23	L.S.	Mobilization Part A- No greater than five percent of Total Bid Price for Part A excluding this item itself		
		_____ Lump Sum		$ _____

Subtotal Bid Page 00300-7 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER SEWER RELIEF

SUMMARY OF BID ITEMS

Subtotal of Bid Page 00300-7	$ _____
Subtotal of Bid Page 00300-6	$ _____
Subtotal of Bid Page 00300-5	$ _____
Subtotal of Bid Page 00300-4	$ _____
Subtotal of Bid Page 00300-3	$ _____
TOTAL PART A BID PRICE	$ _____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.1a		*This item not used in Part B*		
B.2a	225 lin. ft.	Furnish and install 60-inch Class IV reinforced concrete drain pipe including earth excavation and backfill; all depths		
		_____ per linear foot	$ _____	$ _____
B.3a thru B.3b		*These items not used in Part B*		
B.4a thru B.4c		*These items not used in Part B*		
B.5	30 cu. yds.	Test Pits		
		_____ per cubic yard *Transfer unit bid price from Item A.5*	$ _____	$ _____
B.6a	150 cu. yds.	Rock and Boulder Excavation Fixed Bid		
		_____ per cubic yard	$ 110.00	$ 16,500.00
B.6b	150 cu. yds.	Rock and Boulder Excavation Additional Bid		
		_____ per cubic yard *Transfer unit bid price from Item A.6b*	$ _____	$ _____
B.7	225 cu. yds.	Earth excavation below normal grade		
		_____ per cubic yard *Transfer unit bid price from Item A.7*	$ _____	$ _____

Subtotal Bid Page 00300-9 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.8a	5 cu. yds.	Bank-run gravel _____ per cubic yard *Transfer unit bid price from Item A.8a*	$ _____	$ _____
B.8b	5 cu. yds.	Screened gravel _____ per cubic yard *Transfer unit bid price from Item A.8b*	$ _____	$ _____
B.8c	5 cu. yds.	Crushed stone for utility crossings and miscellaneous purposes _____ per cubic yard *Transfer unit bid price from Item A.8c*	$ _____	$ _____
B.8d	1,025 cu. yds.	Common fill _____ per cubic yard *Transfer unit bid price from Item A.8d*	$ _____	$ _____
B.8e	5 cu. yds.	Sand for utility crossings and and miscellaneous purposes _____ per cubic yard *Transfer unit bid price from Item A.8e*	$ _____	$ _____
B.9	L.S.	Dewatering and Drainage _____ lump sum		$ _____
B.10a	5 cu. yds.	Miscellaneous Concrete _____ per cubic yard *Transfer unit bid price from Item A.10a*	$ _____	$ _____

Subtotal Bid Page 00300-10 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.10b	5 cu. yds.	Controlled Density Fill		
		_____ per cubic yard	$ _____	$ _____
		Transfer unit bid price from Item A.10b		
B.11a thru B.11b		*These items not used in Part B*		
B.11c	575 sq. yds.	Cold plane (grind) full width pavement on streets/parking lots		
		_____ per square yard	$ _____	$ _____
		Transfer unit bid price from Item A.11c		
B.11d	575 sq. yds.	Furnish and install final full-width 1.5-inch overlay pavement (Top Course 1.5-inch thick)		
		_____ per square yard	$ _____	$ _____
		Transfer unit bid price from Item A.11d		
B.12	10 hrs.	Provide industrial street sweeper and operator		
		_____ per hour	$ _____	$ _____
		Transfer unit bid price from Item A.12		
B.13a thru B.13d		*These items not used in Part B*		
B.14		*This item not used in Part B*		
B.15 thur B.16		*These items not used in Part B*		
B.17	L.S.	Cleaning of 42-inch diameter Lowell Connector Culvert including permitting		
		_____ lump sum		$ _____

Subtotal Bid Page 00300-11 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.18	L.S.	Complete subsurface boring program to characterize pipe bedding conditions _____ lump sum		$ _____
B.19	L.S.	Furnish and Install 10-foot diameter precast concrete drain manhole (DMH 4-1 on Sheet C-4) at 42-inch Lowell Connector culvert and 12-inch drain pipe connection, including earth excavation and backfill _____ lump sum		$ _____
B.20	L.S.	Furnish and Install 4-foot diameter precast concrete manhole (DMH 4-2 on Sheet C-4) and connecting pipe at 24-inch drain pipe connection, including earth excavation and backfill _____ lump sum		$ _____
B.21	L.S.	Furnish and Install 8-foot x 12-foot precast concrete drain junction struture (DMH 4-3 on Sheet C-4) at 84-inch pipe and 36-inch pipe connection and 5-foot diameter drain manhole (DMH 4-4), including earth excavation and backfill _____ lump sum		$ _____
B.22	L.S.	Miscellaneous Work and Cleanup - Part B _____ Lump Sum		$ _____

Subtotal Bid Page 00300-12 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.23	L.S.	Mobilization Part B- No greater than five percent of Total Bid Price for Part B excluding this item itself _____ lump sum		$ _____

Subtotal Bid Page 00300-13 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

SUMMARY OF PART B BID ITEMS

Subtotal of Bid Page 00300-13	$ _____
Subtotal of Bid Page 00300-12	$ _____
Subtotal of Bid Page 00300-11	$ _____
Subtotal of Bid Page 00300-10	$ _____
Subtotal of Bid Page 00300-9	$ _____
TOTAL PART B BID PRICE	$ _____

TOTAL CONTRACT BID PRICE

TOTAL PART A BID PRICE (Page 00300-8)	$ _____
TOTAL PART B BID PRICE (Page 00300-14)	$ _____
TOTAL CONTRACT BID PRICE (PARTS A+B)	$ _____

Bidders to be considered responsive shall submit bids on Part A and Part B listed in the Bid Form. The low bidder will be determined by comparison of the TOTAL BID PRICE (Part A plus Part B).

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

The bidding and award of this Contract will be in accordance with the provisions of M.G.L., Chapter 30, Sec. 39M.

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

City of Lowell Certificate of Compliance Form shall be completed by the contractor and submitted with the Bid Form as part of the bid documents.

The undersigned will engage the pipe jacking specialty contractor named below to complete the installation of a sewer pipe and casing under the railroad tracks as shown on the Drawings:
_____.
(pipe jacking contractor)

The undersigned agrees to submit to the Owner and Engineer the qualifications package of the pipe jacking contractor (as identified in Section 02340) within three days of the bid opening if the bid is one of the two low bidders. Failure to comply with the requirements of this paragraph may be deemed to render a proposal non-responsive.

Amounts shall be shown in both words and figures, where indicated. In case of discrepancy, the amount shown in words will govern.

The above prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance and incidentals required to complete the Work.

The names and residences of all persons and parties interested in the foregoing Bid as principals are as follows:

(Give first and last names in full. In the case of a corporation, see Article 8.3 of the Instructions to Bidders, in the case of a limited liability company (LLC), see Article 8.4 of the Instructions to Bidders, in the case of a partnership, see Article 8.5 of the Instructions to Bidders.)

_____

_____

_____

Pursuant to M.G.L. ch.62C, sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the

time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

The undersigned hereby certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder; and is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.

_____
Social Security Number or
Federal Identification Number

_____
Signature of Individual or
Corporate Name

By: _____
Corporate Officer (if applicable)

Notice of acceptance should be mailed, faxed, or delivered to the following:

_____
(Name)

By: _____
(Title)

_____
(Business Address)

_____
(City and State)

Date _____

Note: If the Bidder is a corporation, indicate State of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses, if different from business address.

CERTIFICATION OF COMPLIANCE
G.L.c.30, §39S
PUBLIC CONSTRUCTION MORE THAN $10,000.00

I certify under the pains and penalties of perjury that:

1. the Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

2. all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration ("OSHA") that is at least 10 hours in duration and 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

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 OSHA that is at least 10 hours in duration.

_____	_____
Signature of Individual or Corporate Name (Mandatory)	By: Corporate Officer (Mandatory, if applicable)

Approval of a contact or other agreement will not be granted unless this certification clause is signed by the applicant.

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

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

CONTRACTOR AS PRINCIPAL

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

By: _____
Signature

_____
Print Name

_____
Title

Attest:_____
Signature

_____
Title

SURETY

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

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

_____
Print Name

_____
Title

Attest:_____
Signature

_____
Title

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

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

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

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

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

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

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

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

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

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

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

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

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

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

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

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

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

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

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

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

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

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within

two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

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

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

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

16. Modifications to this Bond are as follows:

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PAYMENT BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

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

CONTRACTOR AS PRINCIPAL

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

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

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

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

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

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

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

   5.1 Claimants who do not have a direct contract with the Contractor,

      5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2 Pay or arrange for payment of any undisputed amounts.

   7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

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

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or

(2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

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

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

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

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

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

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

18. Modifications to this Bond are as follows:

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

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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).

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STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

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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

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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

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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

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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

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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

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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:*

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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

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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.

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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

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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,

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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

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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.

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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

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(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.

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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.

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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

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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

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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.

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,

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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,

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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.

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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

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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

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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.

6.18 *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.

6.19 *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

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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

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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.

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

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.

ARTICLE 8 – 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.

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.

8.03 *Furnish Data*

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

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.

8.05 *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 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.

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.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

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

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.

8.12 *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.

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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

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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.

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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

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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

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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, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for

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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.

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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.

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

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

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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.

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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

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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

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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

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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

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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.

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.

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 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*

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*

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

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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.

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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

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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.

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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.

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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.

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SUPPLEMENTARY CONDITIONS

PART I - AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC Document No. C-700, 2007 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01A.42.

Delete paragraph 1.01A.42. of the General Conditions in its entirety and replace with the following:

42. Specifications - Sections included under Division 1 through Division 3 and Divisions 11 of the Project Manual.

SC-1.01A.45.

Insert the following at the beginning of the definition before the words "The time at….."

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

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01B.

Delete paragraph 2.01B. of the General Conditions in its entirety and replace with the following:

B. Before any Work at the site is started, Contractor shall deliver to Owner, with copies to Engineer and each additional insured identified in Article 5 of the Supplementary Conditions, certificates of insurance (and other evidence requested by Owner) which Contractor is required to purchase and maintain in accordance with the requirements of Article 5.

SC-2.03A.

Delete paragraph 2.03A of the General Conditions in its entirety and replace with the following:

A. The Contract Time will commence to run on the Effective Date of the Agreement.

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ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01C.

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

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

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

SC-4.01A.

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

1. If all lands, rights-of-way, and easements are not obtained as herein contemplated before construction begins, Contractor shall begin the Work upon such lands, rights-of-way, and easements as Owner has previously acquired.

SC-4.02A.1.

Delete 4.02 A.1 of the General Conditions in its entirety and replace it with the following:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents. Engineer has relied upon the data obtained from subsurface investigations made at the site in the form of test borings. Such data is in the form of boring logs which are included in the Appendix to the Project Manual and limited soil samples which may be examined upon request during regular business hours. The locations of the test borings are indicated on the Drawings. Such logs and samples are not part of the Contract Documents; and

SC-4.02A.2.

Add the following new paragraph immediately after paragraph 4.02A.2 of the General Conditions which is to read as follows:

a. In the preparation of Drawings and Specifications, the Engineer has relied upon the following tests of subsurface physical conditions at the site. Copies of boring logs are included in the appendix to the Project Manual Soil samples may be examined upon request during regular business hours. Such reports are not part of the Contract Documents.

    1. Particle soil analyses

SC-4.03C.3.

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

D. Adjustments resulting from subsurface or latent physical conditions will be in accordance with Massachusetts General Law Chapter 30, Section 39N included in PART II of the Supplementary Conditions.

SC-4.05A.

Add the following new paragraph immediately after paragraph 4.05A 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-5.03E

Add 2 new paragraphs immediately after paragraph 5.03E of the General Conditions which are to read as follows:

F. Contractor shall provide evidence of its insurance coverage on the ACORD certificate of insurance form and shall include the following statement in its entirety in the section of the form entitled "Description of Operations/Locations/Vehicles/Special Items".

The City of Lowell, MA and CDM Smith, and their officers, directors, partners, employees and other consultants and subcontractors are named as additional insureds with respect to the insured's Commercial General Liability and Automobile Liability Insurance Policies. All insurers waive all rights of subrogation against the City of Lowell, MA and CDM Smith, their officers, directors, partners, employees and other consultants and subcontractors. All insurance is primary for all claims covered thereby. Commercial General Liability Insurance includes contractual liability coverage.

SC-5.04A.

The limits of liability for the insurance required by paragraph 5.04A. of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

5.04.A.1 and 5.04.A.2 Workers' Compensation

(1)	Worker's Compensation	$100,000	
(2)	Employer's Liability	$500,000	Each Occurence

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	$500,000	Disease per employee
(3) U.S. Longshoreman's and Harbor Worker's Compensation	$1,000,000	
(4) Admiralty Jurisdiction, Coverage/Program II	$1,000,000	

5.04A.3., 5.04A.4. and 5.04A.5. Commercial General Liability including Premise/Operations; Explosion, Collapse and Underground Property Damage; Products/Completed Operations, Broad Form Contractual, Independent Contractors; Broad Form Property Damage; and Personal Injury liabilities:

(1) Bodily Injury:	$1,000,000	Each Occurrence
	$1,000,000	Annual Aggregate
(2) Property Damage:	$1,000,000	Each Occurrence
	$1,000,000	Annual Aggregate
(3) Personal Injury:	$1,000,000	Annual Aggregate

5.04 A.6. Comprehensive Automobile Liability including all owned (private and others), hired and non-owned vehicles:

(1) Bodily Injury	$1,000,000	Each Person
	$1,000,000	Each Accident
(2) Property Damage	$1,000,000	Each Occurrence

SC 5.04B.1.

Delete paragraph 5.04B.1. of the General Conditions in its entirety and replace with the following:

1. The insurance required by paragraph 5.04A.3 through 5.04A.6 inclusive will provide primary coverage for all claims covered thereby. With respect to insurance required by Paragraph 5.04.A.6 include as additional insured 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, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds.

SC-5.04B.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 a certificate indicating the policy numbers and minimum

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coverage amounts of all underlying insurance. The umbrella liability insurance shall have a combined single limit of not less than $5,000,000.

8. All polices required by this paragraph 5.04 shall contain provisions to the effect that the insurer(s) waive all right of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

SC-5.05A.

Delete paragraph 5.05A. of the General Conditions in its entirety and replace with the following:

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:

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

SC-5.05A

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

B. All polices 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-5.06A.

Delete paragraphs 5.06A. and A1 thru A7 of the General Conditions in their entirety.

SC-5.06B.

Delete paragraph 5.06B. of the General Conditions in its entirety.

SC-5.06C.

Delete Paragraph 5.06C. of the General Conditions in its entirety.

SC-5.06D.

Delete paragraph 5.06D. of the General Conditions in its entirety.

SC-5.06E.

Delete paragraph 5.06E. of the General Conditions in its entirety.

SC-5.07A.

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Delete paragraph 5.07A. of the General Conditions in its entirety and replace with the following.

A. All insurance policies provided by the Contractor shall contain provisions to the effect that the insurer waives all rights of subrogation against any of the insured, additional insureds, (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) Owner and the Engineer.

SC-5.08A.

Delete paragraph 5.08A. of the General Conditions in its entirety.

SC-5.08B.

Delete paragraph 5.08B. of the General Conditions in its entirety.

SC-5.09A.

Delete paragraph 5.09A. 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-6.02B.

Add the following new paragraphs immediately after paragraph 6.02B. 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 laborer 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 Owner.

E. Contractor and Subcontractors 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.

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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 Part II of these Supplementary Conditions.

SC-6.06A.

Delete Paragraphs 6.06A. and 6.06B. 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 a 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 any Subcontractor, other person or organization against whom Contractor has reasonable objection.

B. Not Used.

SC-6.06C.

Add the following new sentence at the end of paragraph 6.06C. of the General Conditions to read as follows:

Contractor shall make payments to Subcontractors in accordance with Massachusetts General Law Chapter 30, Section 39F which is included in PART II of these Supplementary Conditions.

SC-6.06E.

Add the following new sentence at the end of paragraph 6.06E of the General Conditions to read as follows:

Owner or Engineer may furnish to any such Subcontractor, Supplier or other person or organization, to the extent practicable, information about amounts paid on their behalf to Contractor in accordance with Contractor's Applications for Payment.

SC-6.07B

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

SC-6.10A

Add the following new sentences at the end of paragraph 6.10A of the General Conditions to read as follows:

The materials and supplies to be used in the Work of 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 the requirements of Chapter 14 of the Acts of 1966 and any amendments thereto.

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SC-6.16A.

Delete the last sentence in paragraph 6.16A. 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 Document 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-6.19A.

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

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 in 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, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

2. The Contractor's guarantee under this clause, 6.19B, 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-16.19C. and D.

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

SC-6.19D.

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

E. Manufacturer's Guaranty/Warranty

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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-6.20A.

Delete paragraph 6.20A 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 the 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 of 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-6.20C.

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

SC-6.21E

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

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

SC-6.21E.

Add the following new paragraph immediately after paragraph 6.21E. 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 Part II of the Supplementary Conditions.

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-9.03A.

Add the following new paragraph immediately after paragraph 9.03A of the General Conditions which is to read as follows:

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

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

SC-11.01A.1.

Delete the second sentence in paragraph 11.01A.1. of the General Conditions in its entirety and replace with the following:

Such employees shall include foremen at the site.

SC-11.02A.

Delete paragraphs 11.02A. thru D. of the General Conditions in their entirety.

SC-11.03D.

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Delete paragraph 11.03D. 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 10 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 20 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 for 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 TIME

SC-12.01C.2.a.

Delete “15 percent” in the third line of paragraph 12.01C.2.a of the General Conditions and replace with “twenty percent”.

SC-12.01C.2.b.

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

Delete "five percent" in paragraph 12.01C.2.b of the General Conditions and replace with "seven and one-half percent."

Delete "15 percent" in the sixth line of paragraph 12.01C.2.c, of the General Conditions and replace with "twenty percent" and delete "five percent" in the tenth line and replace with "seven and one-half percent."

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

SC-13.05A.

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

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

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ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02A.3.

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

4. 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-14.02B.1

Delete paragraph 14.02B.1. of the General Condition 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 PART II of these Supplementary Conditions.

SC-14.03A.

Add the following new paragraphs immediately after paragraph 14.03A of the General Conditions which are to read as follows:

B. No materials or supplies for the Work shall be purchased by Contractor or Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

C. Contractor shall defend, indemnify and save Owner and Engineer harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. Contractor shall at Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If Contractor fails to do so, then Owner may, after having served written notice on the said Contractor either pay unpaid bills, of which Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon Owner to either Contractor or Contractor's Surety. In paying any unpaid bills of the Contractor, Owner shall be deemed the agent of Contractor and any payment so made by Owner shall be considered as payment made under the Contract by Owner to Contractor and Owner shall not be liable to Contractor for any such payment made in good faith.

SC-14.07B.1.

Delete paragraph 14.07B.1. of the General Conditions in its entirety and replace with the following:

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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 - all 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 indicate in writing Engineer's recommendation of payment and present the Application to Owner for payment. Thereupon Engineer will 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 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. If the Application and accompanying documentation are appropriate as to form and substance, Owner shall in accordance with the applicable Massachusetts General Law, pay Contractor the amount recommended by Engineer.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

SC-15.01A.

Delete paragraph 15.01A. 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 Part II of the Supplementary Conditions.

SC-15.02A.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-16.01A

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

Either Owner of 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 a new paragraph immediately after paragraph 16.01C.3. of the General Conditions which is to read as follows:

D. Contractor shall carry on the Work and maintain the progress schedule during the dispute resolution proceedings, unless otherwise agreed by Contractor and Owner in writing.

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ARTICLE 17 - MISCELLANEOUS

SC-17.06

Add the following new paragraphs immediately after paragraph 17.06 of the General Conditions which are to read as follows:

17.07 Addresses

A. Both the address given in the Bid Form upon which this Agreement is founded, and Contractor's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to Contractor shall be certified, mailed, or delivered. The delivering at the above named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to Contractor shall be deemed sufficient service thereof upon Contractor; and the date of said service shall be the date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by Contractor, and delivered to Owner and Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon Contractor personally.

17.08 Wage Rates

A. The requirements and provisions of all applicable laws and any amendments thereof or additions thereto as to the employment of labor, and to the schedule of minimum wage rates established in compliance with laws shall be a part of these Contract Documents. Copies of the wage schedules are included in PART II of these Supplementary Conditions. If, after the Notice of Award, it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the officials administrating the laws mentioned above. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation. Contractor shall notify Owner of Contractor's intention to employ persons in trades or occupations not classified in sufficient time for Owner to obtain approved rates for such trades or occupations.

B. The schedules of wages referred to above are minimum rates only, and Owner will not consider any claims for additional compensation made by Contractor because of payment by Contractor of any wage rate in excess of the applicable rate contained in these Contract Documents. All disputes between Contractor and employees of Contractor in regard to the payment of wages in excess of these specified in the schedules shall be resolved by Contractor.

C. The said schedules of wages shall continue to be the minimum rates to be paid during the life of this Agreement and a legible copy of said schedules shall be kept posted in a conspicuous place at the site of the work.

PART II – STATE AND LOCAL GOVERNMENT PROVISIONS

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

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Federal and State provisions are included in Division O following Section 00800. City of Lowell provisions are included in the appendix to the specification.

1.0. COMMONWEALTH OF MASSACHUSETTS PROVISIONS

1.1. Owner and Contractor agree that the following Commonwealth of Massachusetts Provisions apply to the work to be performed under this Contract and that these provisions supersede any conflicting provisions of this Contract.

1.2. Massachusetts General Laws

1.2.1. Chapter 30, Section 39F (5 Pages)

1.2.2. Chapter 30, Section 39G (3 Pages)

1.2.3. Chapter 30, Section 39I (1 Page)

1.2.4. Chapter 30, Section 39J (1 Page)

1.2.5. Chapter 30, Section 39L (1 Page)

1.2.6. Chapter 30, Section 39M (3 Pages)

1.2.7. Chapter 30, Section 39N (1 Page)

1.2.8. Chapter 30, Section 39O (1 Page)

1.2.9. Chapter 30, Section 39P (1 Page)

1.2.10. Chapter 30, Section 39Q (2 Pages)

1.2.11. Chapter 30, Section 39R (4 Pages)

1.2.12. Chapter 30, Section 39S (1 Page)

1.2.13. Chapter 82, Sections 40 and 40A through 40E (7 Pages)

1.2.14. Chapter 82A, Section 1 (1 Page)

1.2.15. Chapter 149, Section 34 (1 Page)

1.2.16. Chapter 149, Section 44J (2 Pages)

1.2.17. Price Adjustments for certain materials in Construction Projects. MGL Chapter 30 Section 38A. (Appendix H– 5 Pages).

1.3. State Wage Rates

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3.0 CITY OF LOWELL PROVISIONS (included as Appendices at the end of the project manual)

3.1 See Appendix E for City of Lowell Ordinance for Excavations and Application for Street Opening and Trench Permits

3.2 See Appendix G for Lowell Regional Water Utility – Contractor Protocol for CSO Projects

3.3 See Appendix H for City of Lowell Certificate of Compliance Form for Public Construction more than $10,000

MASSACHUSETTS GENERAL LAWS

PART I. ADMINISTRATION OF THE GOVERNMENT

TITLE III. LAWS RELATING TO STATE OFFICERS

CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39F. Construction contracts; assignment and subrogation; subcontractor defined; enforcement of claim for direct payment; deposit, reduction of disputed amounts

Section 39F. (1) Every contract awarded pursuant to sections forty-four A to L, inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

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

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

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

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

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

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

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

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

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

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

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

materials used or employed in a public works project for a price in excess of five thousand dollars.

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

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

MASSACHUSETTS GENERAL LAWS

PART I. ADMINISTRATION OF THE GOVERNMENT

TITLE III. LAWS RELATING TO STATE OFFICERS

CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39G. Completion of public works; semi-final and final estimates; payments; extra work; disputed items

Section 39G. Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

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

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would

have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

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

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the

site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

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

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

MASSACHUSETTS GENERAL LAWS

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TITLE III. LAWS RELATING TO STATE OFFICERS

CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39I. Deviations from plans and specifications

Section 39I. Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No wilful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section wilfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

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CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39J. Public construction contracts; effect of decisions of contracting body or administrative board

Section 39J. Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law.

MASSACHUSETTS GENERAL LAWS

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CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39L. Public construction work by foreign corporations; restrictions and reports

Section 39L. The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a contract for the work with, and shall not approve as a subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with the awarding authority a certificate of the state secretary stating that the corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth.

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PART I. ADMINISTRATION OF THE GOVERNMENT

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CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39M. Contracts for construction and materials; manner of awarding

Section 39M. (a) Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, 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 therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said name or described materials.

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

(d) The provisions of this section shall not apply (1) to the extent that they prevent the approval of such specifications by any contributing federal agency, (2) to materials

purchased under specifications of the state department of highways at prices established by the said department pursuant to advertisement and bidding in connection with work to be performed under the provisions of chapter eighty-one or chapter ninety, (3) to any transaction between the commonwealth and any of its political subdivisions or between the commonwealth and any public service corporation, and (4) to any contract of not more than twenty-five thousand dollars awarded by a governmental body, as defined by section two of chapter thirty B, in accordance with the provisions of section five of said chapter thirty B; and (5) to any contract solely for the purchase of material awarded by a governmental body, as defined by section 2 of chapter 30B, in accordance with section 5 of said chapter 30B.

(e) The word “material” as used in this section shall mean and include any article, assembly, system, or any component part thereof.

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CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39N. Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions

Section 39N. Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

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CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39O. Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim

Section 39O. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

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CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 39P. Contracts for construction and materials; awarding authority's decisions on interpretation of specifications, etc.; time limit; notice

Section 39P. Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made.

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Chapter 30: Section 39Q. Contracts for capital facility construction; contents; annual claims report

Section 39Q. (1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In

the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim; the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document.

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Chapter 30: Section 39R. Definitions; contract provisions; management and financial statements; enforcement

Section 39R. (a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) “Audit”, when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) “Accountant’s Report”, when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant’s report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) “Management”, when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor’s independent certified public accountant approving or otherwise commenting on the changes, and

(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) if the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to

(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All

statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

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Chapter 30: Section 39S. Contracts for construction; requirements

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.

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FILING OF PETITIONS

Chapter 82: Section 40. Definitions

Section 40. The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:—

"Company", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

"Description of excavation location", such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

"Emergency", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

"Excavation", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures, excluding excavation by tools manipulated only by human power for gardening purposes and use of blasting for quarrying purposes.

"Excavator", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

"Premark", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on

nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Premarking shall not be required of any continuous excavation that is over 500 feet in length.

“Safety zone”, a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.

“Standard color-coded markings”, red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.

“System”, the underground plant damage prevention system as defined in section 76D of chapter 164.

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Chapter 82: Section 40A. Excavations; notice

Section 40A. No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except in an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of Saturdays, Sundays and legal holidays but not more than 30 days before the proposed excavation is to be made, such excavator has premarked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

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

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

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

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

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

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

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

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

The making of an excavation without providing the notice required by section 40A with respect to any proposed excavation which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person.

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

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

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Chapter 82: Section 40E. Violations of Secs. 40A to 40E; punishment

Section 40E. Any person or company found by the department of telecommunications and energy, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined $1,000 for the first offense and not less than $5,000 nor more than $10,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property.

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CHAPTER 82. EXCAVATION AND TRENCH SAFETY

Chapter 82A: 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).

MASSACHUSETTS GENERAL LAWS

PART I. ADMINISTRATION OF THE GOVERNMENT

TITLE XXI. LABOR AND INDUSTRIES

CHAPTER 149. LABOR AND INDUSTRIES

Chapter 149: Section 34. Public contracts; stipulation as to hours and days of work; void contracts

Section 34. Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working within the commonwealth, in the employ of the contractor, sub-contractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency, or, in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one day, except as aforesaid; provided, that in contracts entered into by the department of highways for the construction or reconstruction of highways there may be inserted in said stipulation a provision that said department, or any contractor or sub-contractor for said department, may employ laborers, workmen, mechanics, foremen and inspectors for more than eight hours in any one day in such construction or reconstruction when, in the opinion of the commissioner, public necessity so requires. Every such contract not containing the aforesaid stipulation shall be null and void.

MASSACHUSETTS GENERAL LAWS

PART I. ADMINISTRATION OF THE GOVERNMENT

TITLE XXI. LABOR AND INDUSTRIES

CHAPTER 149. LABOR AND INDUSTRIES

Chapter 149: Section 44J. Invitations to bid; notice; contents; violations; penalty

Section 44J. (1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefor shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project. Said notice shall also be published at such other times and in such other newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specifications of the proposed work may be had; the time and place of submission of general bids; and the time and place for opening of the general bids. For contracts subject to the provisions of sections forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids.

Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection.

(5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district of municipal agency.

Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

(9) No request for proposals or invitation for bids issued under sections 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.

MASSACHUSETTS GENERAL LAWS

PART I. ADMINISTRATION OF THE GOVERNMENT

TITLE III. LAWS RELATING TO STATE OFFICERS

CHAPTER 30. GENERAL PROVISIONS RELATIVE TO STATE DEPARTMENTS, COMMISSIONS, OFFICERS AND EMPLOYEES

Chapter 30: Section 38A. Price Adjustment clause in Contracts for Road, Bridge, Water and Sewer Projects Awardesd Under Sec. 39M

Section 38A. Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent.

APPENDIX H

PRICE ADJUSTMENTS FOR CERTAIN MATERIALS IN CONSTRUCTION PROJECTS
MGL CHAPTER 30, SECTION 38A

On November 20, 2013, the Massachusetts Legislature passed a bill (Chapter 150 of the Acts of 2013) requiring that water and sewer projects bid under MGL Chapter 30 Section 39M include price adjustment clauses for **fuel** (both diesel and gasoline)**, liquid asphalt** and **portland cement** contained in cast in place concrete for all projects that are advertised for bid after January 1, 2014.

The inclusion of these clauses in the construction contract is the responsibility of the awarding authority, and as such, MassDEP does not dictate what language should be used in the contract. MassDEP will, however, review the contracts to verify that price adjustment clauses have been included.

Awarding Authorities may find value from researching the *price adjustment* information on the Massachusetts Department of Transportation (MassDOT) website at 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.

MassDOT Price Adjustment Clauses

DOCUMENT 00811
SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
ENGLISH UNITS
Revised: 02/02/2009

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

The Price Adjustment will be based on the variance in price for the liquid asphalt component only from the Base Price to the Period Price. It shall not include transportation or other charges. This Price Adjustment will occur on a monthly basis.

Base Price
The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price detailed below.

Period Price
Please note that, starting December 15, 2008, two sets of period prices will be posted each month on the MassHighway website at http://www.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.

******** END OF DOCUMENT ********

DOCUMENT 00812
SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE – ENGLISH UNITS
Revised: 01/26/2009

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

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 ********

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.

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END OF DOCUMENT

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

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

RONALD L. WALKER, II
Secretary

WILLIAM D MCKINNEY
Director

Awarding Authority: City of Lowell

Contract Number: 2-241 **City/Town:** LOWELL

Description of Work: Drainage Work: 650 feet of 24-inch sewer, 130 ft of pipe jacked under existing railroad tracks, flow control structure. 230 ft of 60-inch drain and precast structures, 400 ft of 42-inch pipe cleaning.

Job Location: 849 Pawtucket Street and Hale Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	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 *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	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 *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	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 *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.29	$9.80	$19.23	$0.00	$117.32
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.90	$7.45	$12.65	$0.00	$52.00
	06/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
	12/01/2016	$33.15	$7.45	$12.65	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	12/01/2015	$31.90	$7.45	$12.65	$0.00	$52.00
	06/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
	12/01/2016	$33.15	$7.45	$12.65	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2016	$41.62	$6.97	$16.21	$0.00	$64.80
	01/01/2017	$42.92	$6.97	$16.21	$0.00	$66.10

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$27.05	$6.97	$10.54	$0.00	$44.56
2	65	$27.05	$6.97	$10.54	$0.00	$44.56
3	70	$29.13	$6.97	$11.35	$0.00	$47.45
4	75	$31.22	$6.97	$12.16	$0.00	$50.35
5	80	$33.30	$6.97	$12.97	$0.00	$53.24
6	85	$35.38	$6.97	$13.78	$0.00	$56.13
7	90	$37.46	$6.97	$14.59	$0.00	$59.02
8	95	$39.54	$6.97	$15.40	$0.00	$61.91

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$27.90	$6.97	$10.54	$0.00	$45.41
2	65	$27.90	$6.97	$10.54	$0.00	$45.41
3	70	$30.04	$6.97	$11.35	$0.00	$48.36
4	75	$32.19	$6.97	$12.16	$0.00	$51.32
5	80	$34.34	$6.97	$12.97	$0.00	$54.28
6	85	$36.48	$6.97	$13.78	$0.00	$57.23
7	90	$38.63	$6.97	$14.59	$0.00	$60.19
8	95	$40.77	$6.97	$15.40	$0.00	$63.14

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LOWELL)*	03/01/2016	$47.76	$10.18	$18.54	$0.00	$76.48
	09/01/2016	$48.66	$10.18	$18.62	$0.00	$77.46
	03/01/2017	$49.23	$10.18	$18.62	$0.00	$78.03

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lowell*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.88	$10.18	$18.54	$0.00	$52.60
2	60	$28.66	$10.18	$18.54	$0.00	$57.38
3	70	$33.43	$10.18	$18.54	$0.00	$62.15
4	80	$38.21	$10.18	$18.54	$0.00	$66.93
5	90	$42.98	$10.18	$18.54	$0.00	$71.70

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.33	$10.18	$18.62	$0.00	$53.13
2	60	$29.20	$10.18	$18.62	$0.00	$58.00
3	70	$34.06	$10.18	$18.62	$0.00	$62.86
4	80	$38.93	$10.18	$18.62	$0.00	$67.73
5	90	$43.79	$10.18	$18.62	$0.00	$72.59

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$36.45	$7.45	$13.75	$0.00	$57.65
	06/01/2016	$37.20	$7.45	$13.75	$0.00	$58.40
	12/01/2016	$38.20	$7.45	$13.75	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.30	$7.45	$13.75	$0.00	$56.50
	06/01/2016	$36.05	$7.45	$13.75	$0.00	$57.25
	12/01/2016	$37.05	$7.45	$13.75	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.30	$7.45	$13.75	$0.00	$56.50
	06/01/2016	$36.05	$7.45	$13.75	$0.00	$57.25
	12/01/2016	$37.05	$7.45	$13.75	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2016	$37.10	$9.80	$16.82	$0.00	$63.72
	09/01/2016	$38.08	$9.80	$16.82	$0.00	$64.70
	03/01/2017	$39.05	$9.80	$16.82	$0.00	$65.67
	09/01/2017	$40.06	$9.80	$16.82	$0.00	$66.68
	03/01/2018	$41.06	$9.80	$16.82	$0.00	$67.68
	09/01/2018	$42.10	$9.80	$16.82	$0.00	$68.72
	03/01/2019	$43.13	$9.80	$16.82	$0.00	$69.75

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.55	$9.80	$1.63	$0.00	$29.98
2	60	$22.26	$9.80	$1.63	$0.00	$33.69
3	70	$25.97	$9.80	$11.93	$0.00	$47.70
4	75	$27.83	$9.80	$11.93	$0.00	$49.56
5	80	$29.68	$9.80	$13.56	$0.00	$53.04
6	80	$29.68	$9.80	$13.56	$0.00	$53.04
7	90	$33.39	$9.80	$15.19	$0.00	$58.38
8	90	$33.39	$9.80	$15.19	$0.00	$58.38

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.04	$9.80	$1.63	$0.00	$30.47
2	60	$22.85	$9.80	$1.63	$0.00	$34.28
3	70	$26.66	$9.80	$11.93	$0.00	$48.39
4	75	$28.56	$9.80	$11.93	$0.00	$50.29
5	80	$30.46	$9.80	$13.56	$0.00	$53.82
6	80	$30.46	$9.80	$13.56	$0.00	$53.82
7	90	$34.27	$9.80	$15.19	$0.00	$59.26
8	90	$34.27	$9.80	$15.19	$0.00	$59.26

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LOWELL)*	01/01/2016	$43.51	$10.90	$18.71	$1.30	$74.42

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Lowell*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.76	$10.90	$12.21	$0.00	$44.87
2	60	$26.11	$10.90	$13.71	$1.30	$52.02
3	65	$28.28	$10.90	$14.71	$1.30	$55.19
4	70	$30.46	$10.90	$15.71	$1.30	$58.37
5	75	$32.63	$10.90	$16.71	$1.30	$61.54
6	80	$34.81	$10.90	$17.71	$1.30	$64.72
7	90	$39.16	$10.90	$18.71	$1.30	$70.07

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$44.73	$10.00	$14.90	$0.00	$69.63
	06/01/2016	$45.48	$10.00	$14.90	$0.00	$70.38
	12/01/2016	$46.73	$10.00	$14.90	$0.00	$71.63
	06/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
	12/01/2017	$48.73	$10.00	$14.90	$0.00	$73.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$30.13	$10.00	$14.90	$0.00	$55.03
	06/01/2016	$30.65	$10.00	$14.90	$0.00	$55.55
	12/01/2016	$31.52	$10.00	$14.90	$0.00	$56.42
	06/01/2017	$32.21	$10.00	$14.90	$0.00	$57.11
	12/01/2017	$32.90	$10.00	$14.90	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.23	$7.85	$0.00	$0.00	$33.08
2	55	$27.75	$7.85	$3.66	$0.00	$39.26
3	60	$30.28	$7.85	$3.99	$0.00	$42.12
4	65	$32.80	$7.85	$4.32	$0.00	$44.97
5	70	$35.32	$7.85	$14.11	$0.00	$57.28
6	75	$37.85	$7.85	$14.44	$0.00	$60.14
7	80	$40.37	$7.85	$14.77	$0.00	$62.99
8	90	$45.41	$7.85	$15.44	$0.00	$68.70

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	12/01/2015	$35.50	$7.45	$13.55	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2015	$36.50	$7.45	$13.55	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	12/01/2015	$36.25	$7.45	$13.55	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	12/01/2015	$36.50	$7.45	$13.55	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2015	$36.25	$7.45	$13.55	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	12/01/2015	$35.50	$7.45	$13.55	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$58.86	$9.80	$19.23	$0.00	$87.89
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$63.06	$9.80	$19.23	$0.00	$92.09
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.23	$9.80	$19.23	$0.00	$117.26
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *ELECTRICIANS LOCAL 103*	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN *ELECTRICIANS LOCAL 103*	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.47	$13.00	$0.55	$0.00	$32.02
2	40	$18.47	$13.00	$0.55	$0.00	$32.02
3	45	$20.78	$13.00	$12.34	$0.00	$46.12
4	45	$20.78	$13.00	$12.34	$0.00	$46.12
5	50	$23.09	$13.00	$12.71	$0.00	$48.80
6	55	$25.39	$13.00	$13.07	$0.00	$51.46
7	60	$27.70	$13.00	$13.44	$0.00	$54.14
8	65	$30.01	$13.00	$13.81	$0.00	$56.82
9	70	$32.32	$13.00	$14.18	$0.00	$59.50
10	75	$34.63	$13.00	$14.55	$0.00	$62.18

Notes: :

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

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *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 - 01/01/2016

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

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.93	$15.28	$0.00	$0.00	$43.21
2	55	$30.72	$15.28	$15.71	$0.00	$61.71
3	65	$36.31	$15.28	$15.71	$0.00	$67.30
4	70	$39.10	$15.28	$15.71	$0.00	$70.09
5	80	$44.69	$15.28	$15.71	$0.00	$75.68

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	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 *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2015	$40.49	$10.00	$14.55	$0.00	$65.04
	05/01/2016	$41.03	$10.00	$14.90	$0.00	$65.93
	11/01/2016	$41.62	$10.00	$14.90	$0.00	$66.52
	05/01/2017	$42.50	$10.00	$14.90	$0.00	$67.40
	11/01/2017	$43.23	$10.00	$14.90	$0.00	$68.13
	05/01/2018	$43.94	$10.00	$14.90	$0.00	$68.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2015	$41.93	$10.00	$14.55	$0.00	$66.48
	05/01/2016	$42.47	$10.00	$14.90	$0.00	$67.37
	11/01/2016	$43.07	$10.00	$14.90	$0.00	$67.97
	05/01/2017	$43.96	$10.00	$14.90	$0.00	$68.86
	11/01/2017	$44.69	$10.00	$14.90	$0.00	$69.59
	05/01/2018	$45.41	$10.00	$14.90	$0.00	$70.31
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 *OPERATING ENGINEERS LOCAL 4*	11/01/2015	$21.71	$10.00	$14.55	$0.00	$46.26
	05/01/2016	$21.88	$10.00	$14.90	$0.00	$46.78
	11/01/2016	$22.23	$10.00	$14.90	$0.00	$47.13
	05/01/2017	$22.76	$10.00	$14.90	$0.00	$47.66
	11/01/2017	$23.18	$10.00	$14.90	$0.00	$48.08
	05/01/2018	$23.61	$10.00	$14.90	$0.00	$48.51
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 103*	03/01/2016	$34.63	$13.00	$14.55	$0.00	$62.18
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$36.34	$10.00	$14.90	$0.00	$61.24
	06/01/2016	$36.96	$10.00	$14.90	$0.00	$61.86
	12/01/2016	$38.00	$10.00	$14.90	$0.00	$62.90
	06/01/2017	$38.84	$10.00	$14.90	$0.00	$63.74
	12/01/2017	$39.67	$10.00	$14.90	$0.00	$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 2*	12/01/2015	$20.50	$7.45	$12.65	$0.00	$40.60
	06/01/2016	$20.50	$7.45	$12.65	$0.00	$40.60
	12/01/2016	$20.50	$7.45	$12.65	$0.00	$40.60
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	03/01/2016	$42.13	$9.80	$17.62	$0.00	$69.55

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.07	$9.80	$1.79	$0.00	$32.66
2	55	$23.17	$9.80	$1.79	$0.00	$34.76
3	60	$25.28	$9.80	$12.25	$0.00	$47.33
4	65	$27.38	$9.80	$12.25	$0.00	$49.43
5	70	$29.49	$9.80	$14.04	$0.00	$53.33
6	75	$31.60	$9.80	$14.04	$0.00	$55.44
7	80	$33.70	$9.80	$15.83	$0.00	$59.33
8	85	$35.81	$9.80	$15.83	$0.00	$61.44

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$30.13	$10.00	$14.90	$0.00	$55.03
	06/01/2016	$30.65	$10.00	$14.90	$0.00	$55.55
	12/01/2016	$31.52	$10.00	$14.90	$0.00	$56.42
	06/01/2017	$32.21	$10.00	$14.90	$0.00	$57.11
	12/01/2017	$32.90	$10.00	$14.90	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *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 - 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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.98	$7.85	$0.00	$0.00	$27.83
2	55	$21.98	$7.85	$3.66	$0.00	$33.49
3	60	$23.98	$7.85	$3.99	$0.00	$35.82
4	65	$25.97	$7.85	$4.32	$0.00	$38.14
5	70	$27.97	$7.85	$14.11	$0.00	$49.93
6	75	$29.97	$7.85	$14.44	$0.00	$52.26
7	80	$31.97	$7.85	$14.77	$0.00	$54.59
8	90	$35.96	$7.85	$15.44	$0.00	$59.25

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$24.05	$10.00	$0.00	$0.00	$34.05
2	60	$26.24	$10.00	$14.90	$0.00	$51.14
3	65	$28.42	$10.00	$14.90	$0.00	$53.32
4	70	$30.61	$10.00	$14.90	$0.00	$55.51
5	75	$32.80	$10.00	$14.90	$0.00	$57.70
6	80	$34.98	$10.00	$14.90	$0.00	$59.88
7	85	$37.17	$10.00	$14.90	$0.00	$62.07
8	90	$39.36	$10.00	$14.90	$0.00	$64.26

Effective Date - 06/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$24.46	$10.00	$0.00	$0.00	$34.46
2	60	$26.69	$10.00	$14.90	$0.00	$51.59
3	65	$28.91	$10.00	$14.90	$0.00	$53.81
4	70	$31.14	$10.00	$14.90	$0.00	$56.04
5	75	$33.36	$10.00	$14.90	$0.00	$58.26
6	80	$35.58	$10.00	$14.90	$0.00	$60.48
7	85	$37.81	$10.00	$14.90	$0.00	$62.71
8	90	$40.03	$10.00	$14.90	$0.00	$64.93

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2016	$43.31	$10.70	$21.95	$2.28	$78.24
	08/01/2016	$44.46	$10.70	$21.95	$2.28	$79.39
	02/01/2017	$45.56	$10.70	$21.95	$2.28	$80.49
	08/01/2017	$46.66	$10.70	$21.95	$2.28	$81.59
	02/01/2018	$47.81	$10.70	$21.95	$2.28	$82.74

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2016	$43.31	$10.70	$21.95	$2.28	$78.24
	08/01/2016	$44.46	$10.70	$21.95	$2.28	$79.39
	02/01/2017	$45.56	$10.70	$21.95	$2.28	$80.49
	08/01/2017	$46.66	$10.70	$21.95	$2.28	$81.59
	02/01/2018	$47.81	$10.70	$21.95	$2.28	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2016	$49.19	$9.70	$18.14	$0.00	$77.03
	09/01/2016	$50.19	$9.70	$18.14	$0.00	$78.03
	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2016	$49.19	$9.70	$18.14	$0.00	$77.03
	09/01/2016	$50.19	$9.70	$18.14	$0.00	$78.03
	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	12/01/2015	$31.90	$7.45	$12.65	$0.00	$52.00
	06/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
	12/01/2016	$33.15	$7.45	$12.65	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2015	$43.81	$11.50	$13.80	$0.00	$69.11
	09/01/2016	$45.81	$11.50	$13.80	$0.00	$71.11
	09/01/2017	$47.81	$11.50	$13.80	$0.00	$73.11
	09/01/2018	$50.06	$11.50	$13.80	$0.00	$75.36
	09/01/2019	$52.56	$11.50	$13.80	$0.00	$77.86

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

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.91	$11.50	$10.05	$0.00	$43.46
2	60	$26.29	$11.50	$10.80	$0.00	$48.59
3	70	$30.67	$11.50	$11.55	$0.00	$53.72
4	80	$35.05	$11.50	$12.30	$0.00	$58.85

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.91	$11.50	$10.05	$0.00	$44.46
2	60	$27.49	$11.50	$10.80	$0.00	$49.79
3	70	$32.07	$11.50	$11.55	$0.00	$55.12
4	80	$36.65	$11.50	$12.30	$0.00	$60.45

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (LAWRENCE AREA)*	03/16/2016	$38.99	$7.80	$20.85	$0.00	$67.64
	09/16/2016	$39.64	$7.80	$20.85	$0.00	$68.29
	03/16/2017	$40.24	$7.80	$20.85	$0.00	$68.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Lawrence*

Effective Date - 03/16/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.39	$7.80	$20.85	$0.00	$52.04
2	70	$27.29	$7.80	$20.85	$0.00	$55.94
3	75	$29.24	$7.80	$20.85	$0.00	$57.89
4	80	$31.19	$7.80	$20.85	$0.00	$59.84
5	85	$33.14	$7.80	$20.85	$0.00	$61.79
6	90	$35.09	$7.80	$20.85	$0.00	$63.74

Effective Date - 09/16/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.78	$7.80	$20.85	$0.00	$52.43
2	70	$27.75	$7.80	$20.85	$0.00	$56.40
3	75	$29.73	$7.80	$20.85	$0.00	$58.38
4	80	$31.71	$7.80	$20.85	$0.00	$60.36
5	85	$33.69	$7.80	$20.85	$0.00	$62.34
6	90	$35.68	$7.80	$20.85	$0.00	$64.33

Notes:

Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 2*

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.69	$7.45	$12.65	$0.00	$38.79
2	70	$21.81	$7.45	$12.65	$0.00	$41.91
3	80	$24.92	$7.45	$12.65	$0.00	$45.02
4	90	$28.04	$7.45	$12.65	$0.00	$48.14

Effective Date - 06/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.99	$7.45	$12.65	$0.00	$39.09
2	70	$22.16	$7.45	$12.65	$0.00	$42.26
3	80	$25.32	$7.45	$12.65	$0.00	$45.42
4	90	$28.49	$7.45	$12.65	$0.00	$48.59

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	12/01/2015	$31.35	$7.45	$12.60	$0.00	$51.40
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$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 *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2016	$38.08	$10.18	$17.70	$0.00	$65.96
	08/01/2016	$38.78	$10.18	$17.78	$0.00	$66.74
	02/01/2017	$39.24	$10.18	$17.78	$0.00	$67.20

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

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.04	$10.18	$17.70	$0.00	$46.92
2	60	$22.85	$10.18	$17.70	$0.00	$50.73
3	70	$26.66	$10.18	$17.70	$0.00	$54.54
4	80	$30.46	$10.18	$17.70	$0.00	$58.34
5	90	$34.27	$10.18	$17.70	$0.00	$62.15

Effective Date - 08/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.39	$10.18	$17.78	$0.00	$47.35
2	60	$23.27	$10.18	$17.78	$0.00	$51.23
3	70	$27.15	$10.18	$17.78	$0.00	$55.11
4	80	$31.02	$10.18	$17.78	$0.00	$58.98
5	90	$34.90	$10.18	$17.78	$0.00	$62.86

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2016	$49.90	$10.18	$19.14	$0.00	$79.22
	08/01/2016	$50.80	$10.18	$19.22	$0.00	$80.20
	02/01/2017	$51.37	$10.18	$19.22	$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 - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.95	$10.18	$19.14	$0.00	$54.27
2	60	$29.94	$10.18	$19.14	$0.00	$59.26
3	70	$34.93	$10.18	$19.14	$0.00	$64.25
4	80	$39.92	$10.18	$19.14	$0.00	$69.24
5	90	$44.91	$10.18	$19.14	$0.00	$74.23

Effective Date - 08/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.40	$10.18	$19.22	$0.00	$54.80
2	60	$30.48	$10.18	$19.22	$0.00	$59.88
3	70	$35.56	$10.18	$19.22	$0.00	$64.96
4	80	$40.64	$10.18	$19.22	$0.00	$70.04
5	90	$45.72	$10.18	$19.22	$0.00	$75.12

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	04/01/2015	$34.69	$9.80	$16.21	$0.00	$60.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 04/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.08	$9.80	$4.48	$0.00	$33.36
2	65	$22.55	$9.80	$13.36	$0.00	$45.71
3	75	$26.02	$9.80	$14.18	$0.00	$50.00
4	85	$29.49	$9.80	$14.99	$0.00	$54.28

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$22.27	$10.00	$14.90	$0.00	$47.17
	06/01/2016	$22.66	$10.00	$14.90	$0.00	$47.56
	12/01/2016	$23.31	$10.00	$14.90	$0.00	$48.21
	06/01/2017	$23.82	$10.00	$14.90	$0.00	$48.72
	12/01/2017	$24.34	$10.00	$14.90	$0.00	$49.24
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$26.08	$10.00	$14.90	$0.00	$50.98
	06/01/2016	$26.54	$10.00	$14.90	$0.00	$51.44
	12/01/2016	$27.29	$10.00	$14.90	$0.00	$52.19
	06/01/2017	$27.89	$10.00	$14.90	$0.00	$52.79
	12/01/2017	$28.50	$10.00	$14.90	$0.00	$53.40
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.23	$7.85	$0.00	$0.00	$33.08
2	55	$27.75	$7.85	$3.66	$0.00	$39.26
3	60	$30.28	$7.85	$3.99	$0.00	$42.12
4	65	$32.80	$7.85	$4.32	$0.00	$44.97
5	70	$35.32	$7.85	$14.11	$0.00	$57.28
6	75	$37.85	$7.85	$14.44	$0.00	$60.14
7	80	$40.37	$7.85	$14.77	$0.00	$62.99
8	90	$45.41	$7.85	$15.44	$0.00	$68.70

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2016	$40.41	$7.85	$16.10	$0.00	$64.36
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2016	$41.36	$7.85	$16.10	$0.00	$65.31
	01/01/2017	$42.31	$7.85	$16.10	$0.00	$66.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.68	$7.85	$0.00	$0.00	$28.53
2	55	$22.75	$7.85	$3.66	$0.00	$34.26
3	60	$24.82	$7.85	$3.99	$0.00	$36.66
4	65	$26.88	$7.85	$4.32	$0.00	$39.05
5	70	$28.95	$7.85	$14.11	$0.00	$50.91
6	75	$31.02	$7.85	$14.44	$0.00	$53.31
7	80	$33.09	$7.85	$14.77	$0.00	$55.71
8	90	$37.22	$7.85	$15.44	$0.00	$60.51

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *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 - 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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.71	$7.85	$0.00	$0.00	$27.56
2	55	$21.68	$7.85	$3.66	$0.00	$33.19
3	60	$23.65	$7.85	$3.99	$0.00	$35.49
4	65	$25.62	$7.85	$4.32	$0.00	$37.79
5	70	$27.59	$7.85	$14.11	$0.00	$49.55
6	75	$29.57	$7.85	$14.44	$0.00	$51.86
7	80	$31.54	$7.85	$14.77	$0.00	$54.16
8	90	$35.48	$7.85	$15.44	$0.00	$58.77

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS 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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.98	$7.85	$0.00	$0.00	$27.83
2	55	$21.98	$7.85	$3.66	$0.00	$33.49
3	60	$23.98	$7.85	$3.99	$0.00	$35.82
4	65	$25.97	$7.85	$4.32	$0.00	$38.14
5	70	$27.97	$7.85	$14.11	$0.00	$49.93
6	75	$29.97	$7.85	$14.44	$0.00	$52.26
7	80	$31.97	$7.85	$14.77	$0.00	$54.59
8	90	$35.96	$7.85	$15.44	$0.00	$59.25

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

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

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.01	$7.85	$0.00	$0.00	$26.86
2	55	$20.91	$7.85	$3.66	$0.00	$32.42
3	60	$22.81	$7.85	$3.99	$0.00	$34.65
4	65	$24.71	$7.85	$4.32	$0.00	$36.88
5	70	$26.61	$7.85	$14.11	$0.00	$48.57
6	75	$28.52	$7.85	$14.44	$0.00	$50.81
7	80	$30.42	$7.85	$14.77	$0.00	$53.04
8	90	$34.22	$7.85	$15.44	$0.00	$57.51

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2012	$30.28	$9.07	$8.00	$0.00	$47.35
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.02	$9.80	$19.23	$0.00	$50.05
2	60	$25.22	$9.80	$19.23	$0.00	$54.25
3	70	$29.43	$9.80	$19.23	$0.00	$58.46
4	75	$31.53	$9.80	$19.23	$0.00	$60.56
5	80	$33.63	$9.80	$19.23	$0.00	$62.66
6	80	$33.63	$9.80	$19.23	$0.00	$62.66
7	90	$37.84	$9.80	$19.23	$0.00	$66.87
8	90	$37.84	$9.80	$19.23	$0.00	$66.87

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2016	$49.19	$9.70	$18.14	$0.00	$77.03
	09/01/2016	$50.19	$9.70	$18.14	$0.00	$78.03
	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.68	$9.70	$7.50	$0.00	$36.88
2	45	$22.14	$9.70	$18.14	$0.00	$49.98
3	60	$29.51	$9.70	$18.14	$0.00	$57.35
4	70	$34.43	$9.70	$18.14	$0.00	$62.27
5	80	$39.35	$9.70	$18.14	$0.00	$67.19

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.08	$9.70	$7.50	$0.00	$37.28
2	45	$22.59	$9.70	$18.14	$0.00	$50.43
3	60	$30.11	$9.70	$18.14	$0.00	$57.95
4	70	$35.13	$9.70	$18.14	$0.00	$62.97
5	80	$40.15	$9.70	$18.14	$0.00	$67.99

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 *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2016	$51.36	$11.07	$15.14	$0.00	$77.57
	09/01/2016	$52.41	$11.07	$15.14	$0.00	$78.62
	03/01/2017	$53.41	$11.07	$15.14	$0.00	$79.62

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.98	$11.07	$5.63	$0.00	$34.68
2	40	$20.54	$11.07	$6.37	$0.00	$37.98
3	55	$28.25	$11.07	$8.56	$0.00	$47.88
4	65	$33.38	$11.07	$10.03	$0.00	$54.48
5	75	$38.52	$11.07	$11.48	$0.00	$61.07

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.34	$11.07	$5.63	$0.00	$35.04
2	40	$20.96	$11.07	$6.36	$0.00	$38.39
3	55	$28.83	$11.07	$8.55	$0.00	$48.45
4	65	$34.07	$11.07	$10.02	$0.00	$55.16
5	75	$39.31	$11.07	$11.48	$0.00	$61.86

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$57.78 Step5 with lic$64.37

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2016	$49.19	$9.70	$18.14	$0.00	$77.03
	09/01/2016	$50.19	$9.70	$18.14	$0.00	$78.03
	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03

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

PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75

For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER *LABORERS - ZONE 2*	12/01/2015	$32.15	$7.45	$12.65	$0.00	$52.25
	06/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
	12/01/2016	$33.40	$7.45	$12.65	$0.00	$53.50

For apprentice rates see "Apprentice- LABORER"

POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$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) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$30.13	$10.00	$14.90	$0.00	$55.03
	06/01/2016	$30.65	$10.00	$14.90	$0.00	$55.55
	12/01/2016	$31.52	$10.00	$14.90	$0.00	$56.42
	06/01/2017	$32.21	$10.00	$14.90	$0.00	$57.11
	12/01/2017	$32.90	$10.00	$14.90	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 49*	05/01/2010	$22.88	$6.97	$3.94	$0.00	$33.79
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 2 (Residential Wood)*	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.*CARPENTERS -ZONE 2 (Residential Wood)*	05/01/2011	$24.24	$6.34	$6.23	$0.00	$36.81

As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER 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 *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2016	$40.11	$11.00	$12.90	$0.00	$64.01

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$11.00	$3.39	$0.00	$34.45
2	60	$24.07	$11.00	$12.90	$0.00	$47.97
3	65	$26.07	$11.00	$12.90	$0.00	$49.97
4	75	$30.08	$11.00	$12.90	$0.00	$53.98
5	85	$34.09	$11.00	$12.90	$0.00	$57.99

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 *ROOFERS LOCAL 33*	02/01/2016	$40.36	$11.00	$12.90	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2016	$43.31	$10.70	$21.95	$2.28	$78.24
	08/01/2016	$44.46	$10.70	$21.95	$2.28	$79.39
	02/01/2017	$45.56	$10.70	$21.95	$2.28	$80.49
	08/01/2017	$46.66	$10.70	$21.95	$2.28	$81.59
	02/01/2018	$47.81	$10.70	$21.95	$2.28	$82.74

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.32	$10.70	$4.90	$0.00	$32.92
2	40	$17.32	$10.70	$4.90	$0.00	$32.92
3	45	$19.49	$10.70	$9.79	$1.20	$41.18
4	45	$19.49	$10.70	$9.79	$1.20	$41.18
5	50	$21.66	$10.70	$10.65	$1.29	$44.30
6	50	$21.66	$10.70	$10.90	$1.30	$44.56
7	60	$25.99	$10.70	$12.37	$1.47	$50.53
8	65	$28.15	$10.70	$13.24	$1.56	$53.65
9	75	$32.48	$10.70	$14.97	$1.74	$59.89
10	85	$36.81	$10.70	$16.18	$1.91	$65.60

Effective Date - 08/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.78	$10.70	$4.90	$0.00	$33.38
2	40	$17.78	$10.70	$4.90	$0.00	$33.38
3	45	$20.01	$10.70	$9.79	$1.22	$41.72
4	45	$20.01	$10.70	$9.79	$1.22	$41.72
5	50	$22.23	$10.70	$10.65	$1.31	$44.89
6	50	$22.23	$10.70	$10.90	$1.31	$45.14
7	60	$26.68	$10.70	$12.37	$1.49	$51.24
8	65	$28.90	$10.70	$13.24	$1.59	$54.43
9	75	$33.35	$10.70	$14.97	$1.77	$60.79
10	85	$37.79	$10.70	$16.18	$1.94	$66.61

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

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

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*	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*	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 A) Zone 1*	03/01/2016	$54.43	$8.67	$16.80	$0.00	$79.90
	10/01/2016	$55.53	$8.67	$16.80	$0.00	$81.00
	03/01/2017	$56.53	$8.67	$16.80	$0.00	$82.00

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.05	$8.67	$8.55	$0.00	$36.27
2	40	$21.77	$8.67	$8.55	$0.00	$38.99
3	45	$24.49	$8.67	$8.55	$0.00	$41.71
4	50	$27.22	$8.67	$8.55	$0.00	$44.44
5	55	$29.94	$8.67	$8.55	$0.00	$47.16
6	60	$32.66	$8.67	$8.55	$0.00	$49.88
7	65	$35.38	$8.67	$8.55	$0.00	$52.60
8	70	$38.10	$8.67	$8.55	$0.00	$55.32
9	75	$40.82	$8.67	$8.55	$0.00	$58.04
10	80	$43.54	$8.67	$8.55	$0.00	$60.76

Effective Date - 10/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.44	$8.67	$8.55	$0.00	$36.66
2	40	$22.21	$8.67	$8.55	$0.00	$39.43
3	45	$24.99	$8.67	$8.55	$0.00	$42.21
4	50	$27.77	$8.67	$8.55	$0.00	$44.99
5	55	$30.54	$8.67	$8.55	$0.00	$47.76
6	60	$33.32	$8.67	$8.55	$0.00	$50.54
7	65	$36.09	$8.67	$8.55	$0.00	$53.31
8	70	$38.87	$8.67	$8.55	$0.00	$56.09
9	75	$41.65	$8.67	$8.55	$0.00	$58.87
10	80	$44.42	$8.67	$8.55	$0.00	$61.64

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*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	03/01/2016	$34.63	$13.00	$14.55	$0.00	$62.18

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.85	$13.00	$0.42	$0.00	$27.27
2	40	$13.85	$13.00	$0.42	$0.00	$27.27
3	45	$15.58	$13.00	$11.52	$0.00	$40.10
4	45	$15.58	$13.00	$11.52	$0.00	$40.10
5	50	$17.32	$13.00	$11.79	$0.00	$42.11
6	55	$19.05	$13.00	$12.06	$0.00	$44.11
7	60	$20.78	$13.00	$12.34	$0.00	$46.12
8	65	$22.51	$13.00	$12.62	$0.00	$48.13
9	70	$24.24	$13.00	$12.90	$0.00	$50.14
10	75	$25.97	$13.00	$13.17	$0.00	$52.14

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2016	$48.80	$10.18	$19.14	$0.00	$78.12
	08/01/2016	$49.70	$10.18	$19.22	$0.00	$79.10
	02/01/2017	$50.27	$10.18	$19.22	$0.00	$79.67

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.40	$10.18	$19.14	$0.00	$53.72
2	60	$29.28	$10.18	$19.14	$0.00	$58.60
3	70	$34.16	$10.18	$19.14	$0.00	$63.48
4	80	$39.04	$10.18	$19.14	$0.00	$68.36
5	90	$43.92	$10.18	$19.14	$0.00	$73.24

Effective Date - 08/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.85	$10.18	$19.22	$0.00	$54.25
2	60	$29.82	$10.18	$19.22	$0.00	$59.22
3	70	$34.79	$10.18	$19.22	$0.00	$64.19
4	80	$39.76	$10.18	$19.22	$0.00	$69.16
5	90	$44.73	$10.18	$19.22	$0.00	$74.13

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$36.70	$7.45	$13.75	$0.00	$57.90
	06/01/2016	$37.45	$7.45	$13.75	$0.00	$58.65
	12/01/2016	$38.45	$7.45	$13.75	$0.00	$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.42	$7.45	$13.75	$0.00	$56.62
	06/01/2016	$36.17	$7.45	$13.75	$0.00	$57.37
	12/01/2016	$37.17	$7.45	$13.75	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.30	$7.45	$13.75	$0.00	$56.50
	06/01/2016	$36.05	$7.45	$13.75	$0.00	$57.25
	12/01/2016	$37.05	$7.45	$13.75	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	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 *LABORERS (COMPRESSED AIR)*	12/01/2015	$47.58	$7.45	$14.15	$0.00	$69.18
	06/01/2016	$48.33	$7.45	$14.15	$0.00	$69.93
	12/01/2016	$49.33	$7.45	$14.15	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2015	$49.58	$7.45	$14.15	$0.00	$71.18
	06/01/2016	$50.33	$7.45	$14.15	$0.00	$71.93
	12/01/2016	$51.33	$7.45	$14.15	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2015	$39.65	$7.45	$14.15	$0.00	$61.25
	06/01/2016	$40.40	$7.45	$14.15	$0.00	$62.00
	12/01/2016	$41.40	$7.45	$14.15	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2015	$41.65	$7.45	$14.15	$0.00	$63.25
	06/01/2016	$42.40	$7.45	$14.15	$0.00	$64.00
	12/01/2016	$43.40	$7.45	$14.15	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	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 *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2016	$51.36	$11.07	$15.14	$0.00	$77.57
	09/01/2016	$52.41	$11.07	$15.14	$0.00	$78.62
	03/01/2017	$53.41	$11.07	$15.14	$0.00	$79.62
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Additional Apprentice Information:

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

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

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

Division 1 – General Requirements

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

A. The work of this Contract is located in the city of Lowell, Massachusetts in the Marginal Sewer Relief Pipe area (between Pawtucket Street and Foster Streets) and the LRTA Drainage Improvements area (adjacent to YMCA Drive) as shown on the Drawings.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to construct drain, sewer and water improvements in their entirety as shown on the Drawings and as specified herein.

B. The Work includes, but is not necessarily limited to, the following:

1. Furnish and install pre-cast concrete sewer and drain manholes, structures, and other appurtenances.

2. Make connections, as required, to existing water main, drains, and sewers at locations as shown on the Drawings.

3. Handle existing wastewater and storm water drain with bypass pumping or other approved methods.

4. Test, inspect, and clean new sewer, drain, and water lines.

5. Restore all public and private disturbed areas to pre-construction conditions and as directed.

6. Perform miscellaneous work and cleanup as specified to complete the project.

7. Obtain and comply with the conditions of all permits required for the project, including the NPDES Construction Dewatering Permit, and NPDES Stormwater Permit for Construction Activities.

8. Coordinate water main work as shown on the Drawings with the Lowell Regional Water Utility. Contact: Bob Hogue, 815 Pawtucket Boulevard, Lowell, MA 01854, 978-674-1682.

9. Coordinate temporary and final pavement work with the City of Lowell Engineering Department. Contact: Lisa DeMeo, 375 Merrimack Street, Lowell, MA 01852, 978-970-3331.

10. Coordinate any necessary work identified during the execution of the project with National Grid. Contact: Michael Meneades, 1101 Turnpike Street, North Andover, MA 01845, 978-725-1033.

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11. Coordinate with Lowell Regional Transit Authority at 978-452-6161 to maintain local public transportation routes.

12. Prepare, submit, and implement Traffic Management Plans as specified.

13. Coordinate gas main relocation work with National Grid. Contact: Lien Gauthier, 40 Sylvan Road, Waltham, MA 02451, 617-438-9069.

14. Coordinate telephone work shown on drawings and necessary work identified during the execution of the project with Verizon. Contact: Carolyn Metcalf at 978-323-0281.

Part A - Marginal Relief Sewer Project

15. Furnish and install, including testing and disinfection, 8-inch restrained joint Class 52 ductile iron water main and appurtenances, 8-inch gate valves, and hydrant with anchor tee to replace existing pipe that must be relocated for the new drain, sewer and/or at utility crossing conflicts. Provide temporary water service during construction, as necessary or as identified on the Drawings. Coordinate work with Lowell Regional Water Utility.

16. Furnish and install 24-inch RCP Class IV sewer pipe for Marginal Sewer Relief Pipe.

17. Furnish and install Marginal Sewer Relief Pipe Flow Control Structure. Work includes but not limited to furnishing and installing the precast concrete vault, connections to the existing brick Marginal Street Sewer, connection to new 24-inch diameter sewer relief pipe, manhole frames and covers, all internal components including stop logs and guides, dry weather underflow pipe, formed channels, grout, brick inverts, and brick flow berms.

18. Furnish and install a 48-inch diameter steel casing pipe under the Massachusetts Bay Transportation Authority (MBTA) railroad (operated by Pan Am Railways) as shown on the drawing and specified including the 24-inch diameter Class V RC sewer pipe, jacking and receiving pits and all necessary incidental work.

19. Furnish and install a 6-foot diameter doghouse manhole for the connection of the Marginal Relief Sewer Pipe to the Walker Interceptor.

20. Remove and replace trees with caliper and species as shown on the drawings.

21. Protect light poles and other above surface items as indicated on drawings.

22. Remove and replace existing fence at DPW property. This work shall be coordinated with owner.

23. Furnish and install temporary construction entrance for construction of Marginal Sewer Relief Pipe and remove entrance and restore area to its original condition after the work is completed. Remove and reinstall existing ornamental fence along Pawtucket Street to allow for temporary construction entrance. Remove adjacent chain link fence and replace with ornamental fence along Pawtucket Street as shown on the drawings.

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24. Furnish and install initial/temporary trench width pavement over excavations and final trench-width pavement, or final full-width cold plane and 1.5-inch overlay over most city streets and University of Massachusetts Lowell (UML) South Campus parking lot, as shown on the drawings and specified in Section 02576. Remove cobblestones, reinforced concrete subbase, and/or abandoned railroad tracks to facilitate construction and pavement work. Complete adherence to contract documents regarding trench backfill and compaction requirements shall be followed to avoid settlement.

25. Remove underground brick and concrete building foundations as shown on the drawings and as may be encountered during construction.

26. Comply with the conditions stated in the Lowell Conservation Commission Order of Conditions related to the Marginal Sewer Relief Pipe. Furnish, install and maintain all temporary erosion and siltation control for the duration of the project.

27. Coordinate all work on or near UML South Campus Parking Lot property as shown on the drawings with university officials. **A Temporary Construction Easement and contractor construction staging and material storage area on the UML property has been granted in the easement agreement with UML. The contractor is free to use this area for construction related work at no cost for the duration of the easement period. This easement expires August 19, 2016 and the easement and staging area shall be fully restored by the Contractor for the beneficial use of UML by this date.** No exceptions will be permitted. Marginal Sewer Relief Pipe area contact: Fred Gavriel, UML Facilities Management and Planning, at 978-934-4834.

28. Coordinate all work on or near railroad with Pan Am prior to the commencement of the project. General Contact: Shawn Higgins at Pan Am Railways, 978-663-1127. The contractor will be required to execute a Standard Railroad Service Contract with Pan Am Railways and provide an acceptable Railroad-protective insurance policy to Pan Am Railways Real Estate Department prior to scheduling work**.** Contact Mike Twidle at 978-663-6937 for coordination of all Real Estate requirements. Coordinate Railroad Flagging/Inspection requirements upon finalization of the appropriate documentation with Pan Am Railways Real Estate Department by contacting Keith Kady at 978-808-7413.

29. **The Contractor shall also pay license fees (of a total of $2,822.35) on behalf of the City of Lowell to the MBTA for the sewer easement across the MBTA railroad tracks. Contact Patricia Schuster at 617-316-1660 for payment of the licensing fee.**

<u>Part B - LRTA Parking Lot Drainage Improvements</u>

30. Complete subsurface investigations to define the soil conditions prior to initiating pipe construction per Section 02221 – Earthwork.

31. Complete clearing and grubbing as indicated on the drawings.

32. Furnish and install 12-inch PVC drain, as specified

33. Furnish and install 24-inch DI drain pipe, as specified.

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34. Furnish and install 24-inch, 36-inch, 42-inch, 60-inch and 84-inch Class IV reinforced concrete pipe (RCP) drain pipe, as specified.

35. Furnish and install 4-foot diameter and 5-foot diameter pre-cast concrete drain manholes, riser sections, and other appurtenances as specified and shown on drawings. Installation of the riser sections shall be to the grade instructed by Engineer.

36. Furnish and install 10-foot diameter pre-cast concrete drain manhole, 4-foot diameter riser sections, and other appurtenances as specified and shown on drawings. Installation of the riser sections shall be to the grade as instructed by Engineer. Excavation support and work must be coordinated with MassDOT.

37. Furnish and install 12-foot wide x 8-foot long pre-cast concrete drain structure, 4-foot diameter riser sections, and other appurtenances as specified and shown on drawings. Installation of the riser sections shall be to the grade instructed by Engineer. Excavation support and work shall be coordinated with MBTA.

38. Clean existing 42-inch Lowell Connector culvert and dispose of sediment at Duck Island WWTF. Contractor shall submit a cleaning plan to Owner and MassDOT and shall obtain a permit from the Lowell Conservation Commission for the work for any wetland impacts at the culvert outlet at River Meadow Brook. Coordinate work with Owner, MassDOT, and Lowell Conservation Commission.

39. Regrade LRTA Drainage Improvements site as shown on sheet C-6 as well as loam and seed.

40. Furnish and install temporary LRTA site access management items as shown on Sheet T-1. Coordinate traffic plan for construction vehicle access with LRTA.

1.03 WORK BY OTHERS

A. The Contractor shall coordinate the work on this project with other utility work along city streets including, but not limited to:

None

1.04 WORK SEQUENCE

A. The following work sequence is based on the owner's INTENT of the signed contract agreement by June 1, 2016.

B. Part A – Marginal Relief Sewer, as shown on Sheet C-1, shall be fully complete by August 19, 2016 (the expiration date of the temporary construction easement for the project work on UML property), <u>including all final pavement and full surface restoration of the UML property, and final pavement of all city streets (Pawtucket/Foster/Marginal) and the DPW Yard</u>, as shown on the drawings and specified herein. The temporary construction easement at UML South Campus Parking Lot is available for use by the contractor during construction for staging and material storage at no cost to the contractor. The site must be vacated and fully restored, including final paving, in accordance with the contract documents by August 19, 2016. A separate temporary

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construction entrance to the South Campus Parking lot site shall be provided as shown on the drawings; the site shall be fully restored by the date including cold planning, overlay of final pavement, re-installation of existing and installation of new ornamental fence, and restriping of the parking lot. This includes drain, sewer, water main work, and any associated utility relocations along the following streets and work areas.

C. Allowable work hours shall be Monday through Saturday, excluding holidays, between 7:00 AM to 7:00PM. Requests to work other than regular working hours shall be submitted to Engineer not less than 48 hours prior to any proposed weekend work or scheduled extended work weeks.

1.05 RESTRICTED WORK AREAS

A. No occupancy or work will be allowed at South Campus Parking lot site within the temporary construction easement shown on Sheet C-1 after August 19, 2016.

B. No occupancy or work will be allowed at the DPW Yard as shown on Sheet C-1 after August 19, 2016.

1.06 CONTRACTOR'S USE OF PREMISES

A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for:

1. Work by other contractors.

2. Owner occupancy

3. Public use.

B. Coordinate use of premises with Engineer.

C. Contractor shall assume full responsibility for security of all their own materials and equipment stored on the site, as well as those of his/her subcontractors.

D. If directed by the Engineer, move any stored items that interfere with operations of Owner or other contractors.

E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.07 OWNER OCCUPANCY

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

END OF SECTION

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE

A. This Section includes specification for the measurement and payment of the various elements of the Work; with provisions applicable to lump sum prices, unit prices, and allowances, if applicable.

B. In the case of conflict between this Section and the measurement methods specified in the individual technical Sections, the measurement methods in the technical specifications shall govern.

C. The Contractor shall receive no payment for any portion of the work until it is installed. The only exception to this is payment for stored materials on site if the Contract provides for the payment of stored materials. Partial payment may be requested for items partially installed.

1.02 RELATED WORK - NOT USED

1.03 LUMP SUM ITEMS

A. Lump Sum measurement will be for the entire item, unit of work, structure, or combination thereof, as specified and as indicated in the Bid Form. Measurement and payment for all bid items indicated as Lump Sums shall include the cost of all labor, materials and equipment necessary to furnish, install, clean, test, and place each bid item into operation; including permitting, general conditions, overhead and profit.

B. Progress payments will be based on the Schedule of Values prepared by the Contractor and approved by the Engineer and Owner before acceptance of the first application for payment.

C. In order for the Contractor to request progress payments against Lump Sum items, Contractor shall provide a disaggregation or breakdown in sufficient measureable detail that is acceptable to the Engineer.

D. Measurement

1. Measurement shall be based on the estimated percent complete of each item of the Schedule of Values, as determined by the Engineer.

E. Payment

1. Payment will be made at the lump sum price proportional to the completion percentages approved by the Engineer.

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1.04 UNIT PRICE ITEMS

A. Quantity and measurement estimates stated in the Bid Form are estimates for bidding purposes only. Actual payments shall be based on actual quantities installed, in-place, as measured and/or verified by the Engineer.

B. Unless otherwise provided in the General Conditions, the bid unit prices shall be in effect throughout the contract duration, regardless of variances between the estimated quantities and the actual installed quantities.

C. The Contractor shall make no claim, nor receive any compensation, for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amounts of work actually completed, or materials or equipment furnished, and the estimated quantities

D. Unless otherwise approved by the Owner, any unit quantities exceeded may not be invoiced until the estimated quantity is increased by contract change order.

E. Contractor shall assist Engineer by providing necessary equipment, workers, and survey personnel as required to measure quantities.

F. Measured quantities shall be rounded to the nearest whole integer, unless the value of the unit price exceeds $100, in which case measured quantities shall be rounded to the nearest half unit.

G. Measurement

1. Measurement for progress payment shall be made by, or approved by, the Engineer based on the estimated effective quantity installed. The effective quantity installed represents the actual units or quantities installed, adjusted for incomplete elements or components.

2. Unless otherwise provided for in the Bid Form unit price items are all-inclusive of all related work, direct and indirect, to provide a complete and functional item. For example, underground pipe installation would include trenching, shoring, dewatering, bedding, installation, backfill, testing, flushing, disinfection, and commissioning; including all labor, materials and equipment necessary to furnish, install, clean, test, and place into operation; including permitting, general conditions, overhead and profit.

3. The final measurement shall be based on actual quantities, jointly measured by Contractor and Engineer, complete, fully, tested and placed into service.

H. Payment

1. Progress payments shall be in accordance with the contract documents based on estimated effective quantities installed, paid at the bid unit price.

2. The final payment shall be based on actual quantities, fully installed, tested and placed into service, paid at the bid unit price.

1.05 ALLOWANCES

A. Allowances, if any, specified in the Contract Documents and indicated in the Bid Form are considered provisional amounts to be used only if needed. Allowances are exclusive of work

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indicated in the Contract Documents for which payment is included under other items in the Bid Form. No work may be performed under an allowance without prior written approval of the Owner.

B. Any unused balance of the allowances shall revert to the Owner upon completion of the project. Prior to final payment, the original amount provided for allowances shall be adjusted to actual costs by deductive Change Order, adjusting the contract price, accordingly.

C. The Contractor shall make no claim, nor receive any compensation, for anticipated profits, loss of profit, damages, or any extra payment due to any unexpended portion of the allowances.

D. The Contractor is to include time for allowance work in the construction schedule. No adjustment of Contract Time shall be allowed for any work performed under allowance items.

E. Allowance items shall be included in the Schedule of Values.

F. Unless otherwise indicated in the specific measurement and payment provisions under allowance items, the measurable and allowable costs for work performed under an Allowance item shall be limited to the actual, demonstrable, and direct costs associated with that Allowance item. Shipping and sales taxes are allowable costs.

1. No mark-up for overhead or profit shall be included for payment under an Allowance account item. Overhead and profit shall be included in the contract base bid or allocated across other bid items.

2. Work authorized by the Owner under an allowance may be performed as a lump sum (negotiated before the fact), unit prices (when applicable), or time and material. For work performed under time and material, Contractor shall submit detailed verification (break-down) of all costs, subject to the approval of the Engineer or Owner.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 SEWER PIPE AND APPURTENANCES (Items A.1a)

A. Measurement

1. Sewer pipe of the type and size specified on the Bid Form (Item A.1a) will be measured in place on a linear foot basis. Measurement for payment does not signify that the sewer line is accepted.

a. Measurement of sewer pipe for length will be along the horizontal centerline of the pipe with no deduction for fittings and will be to the center of manholes.

b. Measurement for depth will be from the original ground surface, as determined by the Engineer, to the invert of the pipe. Measurement will be to the nearest tenth of a foot.

B. Payment

1. Payment for furnishing and installing sewer pipe will be made for the respective quantities as determined above at the unit price bid under Item A.1a in the Bid Form. This price and

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payment shall be full compensation for cutting, removing and disposing of existing pavement, removing existing sewer pipeline if necessary, trench excavation (except rock and boulder excavation), backfilling and compaction, restoration of existing curbing, loaming and seeding, impervious dams, pipe closures, environmental protection, maintenance of flow, restoring the trench surface to grade, furnishing crushed stone bedding and encasement, furnishing, laying, jointing, cleaning and testing the pipe, television inspection of sewer pipes, and all incidental work, including driving and removing sheeting and bracing and all else incidental thereto, to complete the work, for which separate payment is not provided under other items in the Bid Form. Payment for any dig and replace sewer rehabilitation work performed until this Contract shall made for the sewer pipe of the type and size specified in the Bid Form (Item A.1a) and will be measured in place on a linear foot basis.

2. Payment will be made for pipe only when it is installed in the ground and not so-called proportional payment for pipe on the site but not yet installed. Payment for satisfactorily installed and backfilled pipe will be paid at 90 percent of the Contract Unit Price. The remaining 10 percent will be paid upon the satisfactory completion of the pipe testing.

3. Excavated spoil material shall be removed from the site and properly disposed. Payment for removal disposal of contaminated soils will be made under Items A.13a thru A.13d.

4. Payment for rock and boulder excavation will be made under Items A.6a or A.6b.

5. Payment for dewatering will be made under Item A.9.

3.02 DRAIN PIPE AND APPURTENANCES (Item B.2a)

A. Measurement

1. Drain pipe of the type and size specified on the Bid Form (Item B.2a**)** will be measured in place on a linear foot basis. Measurement for payment does not signify that the sewer line is accepted.

a. Measurement of drain pipe for length will be along the horizontal centerline of the pipe with no deduction for fittings and will be to the center of manholes.

b. Measurement for depth will be from the original ground surface, as determined by the Engineer, to the invert of the pipe. Measurement will be to the nearest tenth of a foot.

B. Payment

1. Payment for furnishing and installing drain pipe will be made for the respective quantities as determined above at the unit price bid under Item B.2a in the Bid Form. This price and payment shall be full compensation for cutting and removing and disposing of existing pavement, removal and proper disposal of existing sewer and force main pipeline if necessary, trench excavation (except rock and boulder excavation), backfilling and compaction, restoration of existing curbing, loaming and seeding, impervious dams, pipe closures, environmental protection, maintenance of flow, restoring the trench surface to grade, furnishing crushed stone bedding and encasement, furnishing, laying, jointing (including parging of joints for reinforced concrete pipe), cleaning and testing the pipe, television inspection of drain pipes, and all incidental work, including furnishing,

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installing, driving and removing sheeting and bracing and all else incidental thereto, for which separate payment is not provided under other items in the Bid Form.

3. Payment will be made for pipe only when it is installed in the ground and not so-called proportional payment for pipe on the site but not yet installed. Payment for satisfactorily installed and backfilled pipe will be paid at 90 percent of the Contract Unit Price. The remaining 10 percent will be paid upon the satisfactory completion of the pipe testing.

4. Surplus excavated spoils shall be stockpiled on-site.

5. Payment for rock and boulder excavation will be made under Items B.6a or B.6b.

6. Payment for dewatering will be made under Item B.9.

3.03 WATER PIPE AND APPURTENANCES (Items A.3a thru A.3b)

A. Measurement

1. Ductile iron water main of the size specified on the bid sheet (Item A.3a) will be measured in place on a linear foot basis. Measurement for payment does not signify that the water main is accepted. Measurement for length will be along the horizontal centerline of the pipe, with no deductions for valves and fittings. Measurement will be to the nearest tenth of a foot.

2. Compact ductile iron fittings (tees, bends, crosses, reducers, transition couplings, solid sleeves, etc) installed in the completed project (Item A.3b) shall be measured by the pound, excluding cement lining, based on tabular weights obtained from the current ANSI Standards. The weight of the fittings shall not include the weight of glands, bolts, nuts, gaskets or accessories.

B. Payment

1. Payment for furnishing and installing ductile iron water pipe of the class and size specified will be made for the respective quantities as above determined, at the applicable price per linear foot bid under Item A.3a in the Bid Form. Such price and payment shall be full compensation for removal and disposal of abandoned water main, furnishing, installing, chlorinating, maintaining and removal of temporary water service as specified in Section 02656, cutting existing pavement; trench excavation (excluding rock and boulder excavation); placing crushed stone where required; sheeting and bracing; dewatering and drainage; furnishing and installing any geotextile filter fabric; disposal of excess excavated material; furnishing, laying and jointing the pipe, including specified restrained joints; connections to existing water mains; backfilling; restoring the trench surface to grade; restoring all physical features to grade, including curbs, sidewalks and driveways; cleaning, chlorinating and testing the pipe and all else incidental thereto for which separate payment is not provided under other Items in the Bid Form.

2. Payment for furnishing and installing fittings and couplings based on weights as herein specified will be made under Item A.3b. Payment shall not include weight of glands, bolts, nuts, gaskets or accessories. Price and payment shall be full compensation for furnishing and installing the fitting with cement lining, glands, bolts, nuts, gaskets, jointing and all

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work required for, or incidental to the satisfactory completion of the Item for which payment is not provided under other items in the Bid Form.

3. Contractor is advised that existing 4-inch water main may be encountered during construction. 4-inch replacement parts should be made available on-site for repairs to the existing 4-inch water mains. Payment shall be made under the 6-inch water main line items, respectively.

4. All new water mains shall have restrained joints on each side of all fittings.

5. Payment for rock and boulder excavation will be made under Items A.6a or A.6A.

6. Payment for dewatering will be made under Item A.9.

3.04 PRECAST CONCRETE MANHOLES (Items A.4a thru A.4c)

A. Measurement

1. Precast concrete manholes (Items A.4a thru A.4b) will be measured in vertical feet from the invert of the lowest pipe of the manhole or top of manhole tee section to the top of the manhole frame.

2. Measurement for payment for materials and construction of doghouse manhole on sheet C-1 (Item A.4c) shall be on a lump sum basis.

B. Payment

1. Payment for furnishing and installing precast concrete manholes complete in place will be made for the quantity as above determined at the price per vertical foot bid for Items A.4a thru A.4b which price and payment shall be full compensation for all excavation (except rock and boulder), backfilling, for furnishing and installing precast sections and bases, frames and covers, crushed stone subbase, all forms, reinforcing, concrete and masonry materials, top slabs for shallow manholes if used, and all else incidental thereto, for which separate payment is not provided under other items in the Bid Form.

2. Payment of the lump sum bid for Item A.4c shall be full compensation for furnishing all labor, materials, equipment, and shall include any other miscellaneous work required to construct the doghouse manhole and base, perform all pipe connections, maintain existing flows, dewatering, installation and later removal of sheeting and bracing, furnishing and installing pre-cast manhole portion of the work, frame, cover and all related work as shown on the Drawings and specified herein. **Payment for this item will include the excavation and backfill and installation of sewer pipe to a limit along the pipe up to 10 feet from the center of the doghouse manhole. Payment for pipe outside of this limit will be made Item A.1.a**

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3.05 TEST PITS (Items A.5 and B.5)

A. Measurement

1. Test pits (Items A.5 and B.5) will be measured in cubic yards in accordance with the following established volume rates:

Test Pit Depth	Cu. yds per vert. ft
0 to 8 ft	1.5
8 to 12 ft	3.0
12 to 16 ft	4.5
16 to 20 ft	6.0

B. Payment

1. Payment for test pits will be made for the quantities as determined herein at the price per cubic yard bid for Items A.5 and B.5 in the Bid Form. This price shall be full compensation for excavation (including hand excavation and/or vacuum excavation as directed), backfill, compaction, restoring trench surface to grade, temporary pavement and all incidental work required to complete the test pits for which separate payment is not provided under other items in the Bid Form.

3.06 ROCK AND BOULDER EXCAVATION (Items A.6a thru A6.b and Items B.6a thru B6.b)

A. Measurement

1. When rock is encountered, the material shall be uncovered and the Engineer notified. The Engineer will then take cross sections of the rock surface. If the Contractor fails to uncover the ledge, notify the Engineer and allow ample time for cross sectioning the undisturbed material, the Contractor shall have no right-of-claim to any classification other than that allowed by the Engineer. Removal of old concrete foundations or abandoned telephone conduits and associated structures, if any, shall be classified as rock.

2. Measurement of rock excavation in pipe trenches will extend to the width as specified. The limits are as follows:

Depth from Ground Surface to Invert of Pipe	Pay Width (Nominal Pipe Diameter)	
	0 to 24-in	over 24-in
0 to 12-ft	5-ft-0-in	D + 3-ft-0-in
12-ft to 20-ft	7-ft-0-in	D + 5-ft-0-in
20-ft to 24-ft	8-ft-0-in	D + 5-ft-0-in

a. Measured widths for depths over 24-ft shall be determined case-by-case consistent with the foregoing chart.

A. Payment depth for rock which is encountered in a trench shall be no less than three feet when removal can be accomplished only by drilling and blasting or by use of jack (air or hydraulic) hammers.

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c. Payment for rock removed, using the same or equal equipment as utilized for normal trench excavation, shall be limited to the actual depth removed within the limits established by the contract documents.

3. Measurement for depth shall be from the top of the rock formation to the normal depth of the pipe as shown on the Drawings.

4. The pay limit for rock and boulder removal for manholes and catch basins shall commence one foot outside the widest dimension of the structure or shall be the maximum connecting trench width, whichever is greater. No allowance will be made for overbreakage.

5. Boulders and concrete structures exceeding 1 cu. yd. in volume when encountered in excavation will be measured for payment. Removal of boulders of whatever size will not be paid for when encountered in borrow areas.

6. The quantity of rock and boulder excavation to be paid for shall be the number of cubic yards of rock or boulders measured in place within the limits herein specified.

7. Removal of concrete subbase and/or cobblestones encountered during construction shall be the number of cubic yards measured in place as approved by the Engineer, and shall be paid for under the fixed bid rock and boulder excavation item.

B. Payment

1. Payment for rock and boulder excavation will be made for the quantities as determined above at the fixed unit price bid for Items A.6a and B.6a in the Bid Form plus any additional unit price bid for Items A.6b and B.6b. This price and payment shall be full compensation for excavation, pre-blast survey, blasting and disposal of rock and boulder, backfilling and providing borrow for any deficiency of trench backfill and all work incidental thereto, for which payment is not provided under other items. Removal of old concrete foundations or abandoned telephone conduits and associated structures, if any, shall be classified as rock.

2. No payment will be made under Items A.8a thru A.8e and Items B.8a thru B.8e for refill material to replace any deficiency of backfill material.

3.07 EARTH EXCAVATION AND REFILL BELOW NORMAL GRADE (Items A.7 and B.7)

A. Measurement

1. Measurement of earth excavation and refill below normal grade will extend only downward from the dimensions defining normal grade to a depth determined by the Engineer and as shown on the Drawings, and for a width as defined above for rock excavation or as approved by the Engineer.

2. If the trench bottom is below normal grade through error by the Contractor or if improper drainage softens the subgrade and additional excavation in the trench is required before laying the pipe, such removal and replacement of material will not be measured for payment

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B. Payment

1. Payment for earth excavation below normal grade will be made for the quantity as above-determined at the price per cubic yard bid for Items A.7 and B.7 in the Bid Form which price and payment shall be full compensation for excavation and disposal of all materials below normal grade, and all other work incidental thereto for which separate payment is not provided under other items in the Bid Form.

2. Payment will be made under Items A.8a thru A.8e and Items B.8a through B.8e for refill below normal grade.

3.08 FILL MATERIALS (Items A.8a thru A.8e and Items B.8a thru B.8e)

A. Measurement

1. Bank-run gravel (Items A.8a and B.8a), when its use is approved and when furnished, placed and compacted for pavement sub-base and for miscellaneous uses will be measured in cubic yards at actual in-place dimensions as determined by the Engineer. When used for pavement sub-base the widths for payment shall not exceed those defined for initial trench pavement. No allowance will be made for loss from consolidation of material. Truck measurement will not be permitted.

2. Screened gravel (Items A.8b and B.8b) when its use is approved and when furnished, placed and compacted for sub-base will be measure in cubic yards at actual in-place dimensions as determined by the Engineer. When used for subbase the widths for payment shall not exceed those defined for initial trench pavement. No allowance will be made for loss from consolidation of material. Truck measurement will not be permitted.

3. Crushed stone (Items A.8c and B.8c) used in conjunction with utility crossings and at other locations when the Engineer orders its use will be measured in cubic yards at actual in-place dimensions as determined by the Engineer. When used in trenches the payment limits shall not exceed the trench widths defined for rock.

4. Common fill borrow (Items A.8d and B.8d) when its use is required and approved and when furnished, placed and compacted for trench backfill and miscellaneous uses, will be measured in cubic yards at the actual in-place dimensions as directed by the Engineer. The maximum trench width for payment shall be as given for rock (Items A.6a or A.6b). No allowance will be made for loss from consolidation of material. Truck measurement will not be permitted. No additional payment will be made under this item for use of excavated material and any surplus material generated from the construction of this project.

5. Sand (Items A.8e and B.8e) used in conjunction with utility crossings and at other locations when the Engineer orders its use will be measured in cubic yards at the actual in-place dimensions as determined by the Engineer.

B. Payment

1. Payment for furnishing and placing bank-run gravel, screened gravel, common fill, crushed stone, sand will be made for the quantity determined above at the respective price bid for Items A.8a thru A.8e and Items B.8a thur B.8e in the Bid Form. This price and payment

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shall be full compensation for furnishing, hauling, placing, compacting and all else incidental thereto for which separate payment is not provided under other items.

2. Payment for refill material to replace unsuitable backfill material will be included under Items A.8d and B.8d.

3. Payment for crushed stone used in pipe bedding and encasement for ductile iron, PVC and RCP pipe will be included with the respective pipe items.

4. Payment for crushed stone used in sub-base for manholes, manhole tees, bends and catch basins will be included under Items A.4a thru A.4c.

5. Payment for gravel refill materials to refill rock and boulder excavation will be included under Items A.6a and A.6b and Items B.6a and B.6b.

6. Payment for common fill for regrading of LRTA Drainage Improvements Site as shown on Sheet C-6 will be included Item A.8d.

3.09 DEWATERING AND DRAINAGE (Items A.9 and B.9)

A. Measurement

1. Measurement for payment for dewatering and drainage shall be on a lump sum basis.

2. Measurement for payment for dewatering associated with doghouse manhole, pipe jacking under railroad property, and Marginal Sewer Relief Control Structure, shall be included with bid items A.4c, A.15, and A.16.

3. Measurement for payment for dewatering associated with the three special structures/connections on Sheet C-3 shall be included with bid items B.19, B.20, and B.21.

B. Payment

1. Payment of the lump sum price bid for Item A.9 shall be full compensation for all labor, equipment, materials and incidentals necessary to handle ground water and surface water as specified in Section 02140 including but not limited to sinking well points, furnishing, installing and maintaining pumping systems including all pumps, piping, casing and other appurtenances, filter sand required for underdrains or pumping systems, erosion and sediment control, furnishing, installing and maintaining observation wells and all else incidental thereto for which separate payment is not provided under other items.

3.10 MISCELLANEOUS CONCRETE AND CONTROLLED DENSITY FILL (Items A.10a and A.10b and Items B.10a and B.10b)

A. Measurement

1. Measurement for payment for miscellaneous concrete (Items A.10a and B.10a) furnished and installed shall be the actual number of cubic yards placed or as determined by the Engineer.

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2. Measurement for payment for controlled density fill (Items B.10a and B.10b) furnished and installed shall be the actual number of cubic yards placed or as determined by the Engineer.

B. Payment

1. Payment for miscellaneous concrete will be made for the quantity as above-determined at the unit price bid in the Bid Form for Items A.10a and B.10a and shall be full compensation for furnishing and placing the concrete including form work, reinforcing and other materials required, complete as shown on the Drawings and as specified herein.

2. Payment for controlled density fill will be made for the quantity as above determined at the unit price bid in the Bid Form for Items A.10b and B.10b and shall be full compensation for furnishing and placing controlled density fill including formwork and other materials required for backfilling locations where new sewer or drain pipes cross under water mains and for filling abandoned pipes or structures as directed by the Engineer.

3.11 PAVEMENT REPLACEMENT (Items A.11a thru A.11d and Items B.11c thru B.11d)

A. Measurement

1. For temporary trench width pavement, where the depth of the pipe invert is 0 to 8 feet, Type I-1 bituminous concrete (Item A.11a) measurement for payment will be in square yards as actually placed, but not exceeding the limits given below:

Nominal Pipe Diameter	Temporary Pavement	Final Trench Pavement
0-24”	78”	102”

a. Where the nominal pipe diameter is greater than 24” the maximum width for initial pavement shall be the nominal diameter of the pipe plus four (4) feet, and for permanent trench pavement the maximum eligible width shall be the nominal pipe diameter plus six (6) feet.

b. For each additional four (4) feet (or fraction thereof) of pipe invert depth, add three feet to the eligible width limit (8 feet).

2. For final (permanent) trench width pavement (Items A.11b), measurement for payment will based on the temporary trench width pavement limits as described in Items A.11a and A.11b above plus a minimum of one foot back from the top of the initial trench walls so that new pavement will be placed over undisturbed material.

3. Measurement for payment to cold plane (Item A.11c and Item B.11c) existing city streets and the DPW Yard to a depth of approximately 1.5-inch thick will be by the square yard as determined by the Engineer.

4. Measurement for payment of 1.5-in full-width overlay bituminous concrete pavement (Item A.11d and Item B.11.d) will be by the square yard as determined by the Engineer.

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B. Payment

1. Payment for temporary trench width pavement, Type I-1 bituminous concrete, complete in place and approved by the Engineer, will be made for the quantity determined above at the price bid for Item A.11a in the Bid Form. This price and payment for initial pavement shall be full compensation for saw cutting pavement, cleaning and priming the edges of the existing pavement, cleaning and preparing the surface of the gravel base, furnishing, placing and maintaining the initial pavement, relining all streets with pavement markings equal in type and location where existing prior to paving, including labor, materials and all else incidental thereto for which payment is not provided under other items.

2. Payment for final trench width pavement, Type I-1 bituminous concrete, complete in place and approved by the Engineer, will be made for the quantity determined above at the price bid for Item A.11b in the Bid Form. This price and payment shall be full compensation for removing temporary bituminous concrete pavement, saw cutting, cleaning and priming the edges of the existing pavement with tack coat, cleaning and preparing the surface of the gravel base, removing and resetting catch basin frame and grates, manhole rims and covers, and gate boxes to grade, furnishing and placing tack coat before laying top course, furnishing, placing, compacting and maintaining the binder and top course pavement for the warranty period, relining all streets with pavement markings equal in type and location where existing prior to paving, including labor, materials, and all else incidental thereto for which payment is not provided under other items in the Bid Form. This price and payment shall also be full compensation for performing infra-red treatment and sealing of all pavement joints in conjunction with the placement of permanent trench pavement to create a smooth driving surface consistent with the existing roadway.

3. Payment for cold plane (Item A.11c and Item B.11c) of full width city streets 1.5-inch thick shall be full compensation for preparing the surface of the street and all else incidental thereto.

4. Payment for full width final pavement 1.5-inch thick overlay (Item A.11d and Item B.11d), complete and in place shall be full compensation for cleaning and preparing the surface of the street, raising catch basin frames and grates, manhole rims and covers, and gate boxes to new grade, priming initial and existing pavement with tack coat, placing leveling course over the trench when required and furnishing and placing bituminous pavement over the full width of the street without removing initial paving, restoring pavement markings and all else incidental thereto.

5. Payment for restoring bituminous concrete sidewalks, driveways and curbing (except sewer, drain, water, and sump pump service connections which are covered under other items) to at least original condition will be made under Miscellaneous Work and Cleanup (Items A.22 and B.22).

6. If the thickness of pavement ordered placed by the Engineer is greater than that specified, payment will be prorated on the basis of the thickness of material actually ordered placed. No payment will be made for any additional pavement not specifically ordered in writing by the Engineer.

7. Payment for leveling course within the Contractor's work area, if required, will be included in Items A.11a.

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8. Payment for leveling trenches outside the initial trench width limits will be made under Items A.11d.

9. Payment under Items A.11a thru A.11d shall include all costs of furnishing, storing and applying calcium chloride as required for dust control.

10. Asphalt Cement Adjustments will be evaluated per MassDOT Price Adjustments.

3.12 STREET SWEEPER (Items A.12 and B.12)

A. Measurement

1. Measurement for payment for providing an industrial street sweeper (Items A.12 and B.12) shall be on an hourly basis for the time ordered in writing by the Engineer or the Owner.

2. Normal daily cleanup work is included in Section 01046 and will not be measured for payment under this item.

B. Payment

1. Payment for the street sweeper will be made for the quantities as determined above at the unit price bid for Items A.12 and B.12 in the Bid Form. This price and payment shall be full compensation for furnishing all labor and equipment and refill water required to sweep clean all pavement areas required in addition to normal cleanup, which is included under other items.

2. Payment shall be for an operator and a three-wheel, 5.75 cubic yard double gutter broom street sweeper equal to Model Vanguard V3000SP by Johnson Sweeper Co., Pomona, CA.

3.13 CONTAMINATED SOIL DISPOSAL (Items A.13a thru A.13d)

A. Measurement

1. Measurement for payment for contaminated waste disposal to an in-state unlined landfill (Item A.13a) shall be the actual number of tons removed or as determined by the Engineer.

2. Measurement for payment for contaminated waste disposal to a lined landfill (Item A.13b) shall be the actual number of tons removed or as determined by the Engineer.

3. Measurement for payment for contaminated waste disposal as a RCRA hazardous waste (Item A.13c) shall be the actual number of tons removed or as determined by the Engineer.

4. Measurement for payment for contaminated waste disposal as an asbestos containing waste (Item A.13d) shall be the actual number of tons removed or as determined by the Engineer.

B. Payment

1. Payment for contaminated soil disposal to an in-state unlined landfill will be made for the quantity as above determined at the unit price bid for Item A.13a and shall include full compensation for furnishing all labor, materials, development of a soil management plan and completion of waste manifests, temporary stockpiling, Health and Safety requirements,

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regulatory agency communications, sampling and testing, loading and hauling, disposal costs, and equipment required for disposal of all contaminated soil to an unlined landfill.

2. Payment for contaminated soil disposal to a lined landfill will be made for the quantity as above determined at the unit price bid for Item A.13b and shall include full compensation for furnishing all labor, materials, development of a soil management plan and completion of waste manifests, temporary stockpiling, Health and Safety requirements, regulatory agency communications, sampling and testing, loading and hauling, disposal costs, and equipment required for disposal of all contaminated soil to a lined landfill.

3. Payment for contaminated soil disposal at a RCRA waste permitted disposal facility will be made for the quantity as above determined at the unit price bid for Item A.13c and shall include full compensation for furnishing all labor, materials, development of a soil management plan and completion of waste manifests, temporary stockpiling, Health and Safety requirements, regulatory agency communications, sampling and testing, loading and hauling, disposal costs, and equipment required for disposal of all contaminated soil to a lined landfill.

4. Payment for contaminated soil disposal to a facility suitable for disposal of asbestos containing waste will be made for the quantity as above determined at the unit price bid for Item A.13d and shall include full compensation for furnishing all labor, materials, development of a soil management plan and completion of waste manifests, temporary stockpiling, Health and Safety requirements, regulatory agency communications, sampling and testing, loading and hauling, disposal costs, and equipment required for disposal of all contaminated soil to a lined landfill.

5. Excavation of contaminated soil shall be paid for under the pipe items.

3.14 RAILROAD INSPECTION SERVICES/FLAGMAN (Items A.14)

A. Measurement

1. Measurement for payment for railroad inspections by Pan-Am Railways and fees for the Marginal Relief Sewer project or by MBTA or its representative for the LRTA project (Items A.14) shall be made on a daily basis (one day = 8 hours).

B. Payment

1. Payment for Railways Inspection Services (Items A.14) will be made for the actual amount invoiced to the Contractor by the railway inspection entity or fees established by the MBTA for the pipe jacking, including the license fee of $2822.35, with no Contractor mark-up. The established lump sum in the Bid Form is for bidding purposes only. Railways inspection will be required as directed by the Engineer and Owner, in coordination with Pan Am Railways for the Marginal Relief Sewer and by the MBTA representative for the LRTA project, if required.

2. Payment for the work performed will be made against the lump sum. The lump sum amount for this item will be adjusted to reflect the actual cost of the invoices approved at the end of the project for work actually performed under this item.

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3.15 PIPE JACKING UNDER RAILROAD PROPERTY (Item A.15)

A. Measurement

1. Measurement for payment for furnishing and installing the 48-inch steel casing/jacking sleeve, 24-inch Class V RCP sewer (carrier pipe), and work on and in the vicinity of property owned by MBTA and operated by Pan Am railroad Item A.15 shall be on a lump sum basis.

B. Payment

1. Payment of the lump sum price bid for Item A.15 shall be full compensation for all costs for furnishing and installing the 24-inch Class V RCP sewer within a 48-inch steel casing/jacking sleeve under and adjacent to the railroad tracks to the limits shown on Sheet C-1. Such costs shall include, but not be limited to, additional costs of insurance on behalf of the railroad; excavation (excluding rock and boulder); removal and replacement of existing 12-inch RCP drain pipes within pipe jacking excavation area; dewatering; furnishing, installing, driving, and removing sheeting and bracing; jacking and receiving pits; maintaining the pits in an acceptable condition; removing and disposing of any excess material; furnishing and installing common fill, skid runners, grout, straps, and brick bulkheads; testing; backfilling jacking and receiving pits; sedimentation and erosion control; and all other work, labor, materials and equipment required to perform the work as specified in section 2340 and 02450, and as shown on the Drawings and as specified herein.

2. Manholes shall be paid for under Item A.4a.

3. Payment of the MBTA license fee shall be paid for under Item A.14

3.16 PRECAST MARGINAL SEWER RELIEF STRUCTURE (Item A.16)

A. Measurement

1. Measurement for payment for precast marginal sewer relief structure (Item A.16) shall be paid for on a lump sum basis.

B. Payment

1. Payment for furnishing and installing the precast marginal sewer relief structure (Item A.16) complete and in place will be determined at the lump sum bid price for each item in the Bid Form. This price and payment shall be full compensation for all excavation (except rock and boulder), removal of existing water main and hydrant, excavation trench support, dewatering, backfilling, precast base and riser sections, connections to existing brick sewer and new 24-inch pipe, all interior components including stop logs and guides, 8-inch DI dry weather flow pipe, frame and cover, structural fill, crushed stone subbase, all forms, reinforcing, removal and replace of bituminous and/or granite curbing, and all else incidental thereto, for which separate payment is not provided under other items in the Bid Form.

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3.17 CLEANING OF 42-INCH LOWELL CONNECTOR CULVERT (Item B.17)

C. Measurement

1. Measurement for heavy cleaning of the 42-inch Lowell Connector culvert (Item B.17) shall be paid for on a lump sum basis

D. Payment

1. Payment of the lump sum bid for Item B.17 shall be full compensation for furnishing all labor, materials, equipment, and shall include any other miscellaneous work required to remove all sediment from within the existing 42-inch culvert under the Lowell Connector as shown on Sheet C-3 and Appendix M MassDOT Permit to Access State Highway for Cleaning 42-inch Culvert, including maintenance of existing flows, dewatering, erosion protection, sediment removal (either by bucket and drag, flushing or some other approved method) and capture, sediment transportation and disposal at Duck Island WWTF, site restoration and all related work as shown on the Drawings and specified herein.

2. Payment of the lump sum bid for Item B.17 shall also include full compensation for the permitting of the cleaning project through the Lowell Conservation Commission including preparation of the Notice of Intent, attendance at a Conservation Commission meeting to present the project, filing of the Order of Conditions, and adherence to the Order of Conditions requirements during the completion of the work.

3.18 SUBSURFACE INVESTIGATIONS (Item B.18)

A. Measurement

1. Measurement for subsurface investigations (Item B.18) shall be paid for based on the work performed and the approved invoice.

B. Payment

1. Payment of the lump sum bid for Item B.18 shall be full compensation for the actual cost of services provided by a boring subcontractor to complete subsurface investigations of the site before construction starts.

2. The Contractor shall obtain at least two cost estimates to provide the scope of work for subsurface investigations to be provided by the ENGINEER. The cost estimates shall be obtained from boring subcontractors that have adequate experience in the performance of the work and as approved by the Engineer. The OWNER shall select the suitable cost estimate.

3. The Contractor shall invoice the work performed by the boring subcontractor, and as approved by the Engineer, including Contractor mark-up for overhead and profit as allowed under the General Conditions.

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4. Payment for the work performed will be made against the lump sum. The lump sum amount for this item will be adjusted to reflect the actual cost of the invoices approved at the end of the project for work actually performed under this item.

3.19 PRECAST CONCRETE CONNECTION STRUCTURES (Items B.19 thru B.21)

A. Measurement

1. Measurement for payment for materials and construction of the precast concrete connection structures on Sheet C-4 for DMH 4-1, DMH 4-2, DMH 4-3, and DMH 4-4 (Items B.19 thru B.21) shall be on a lump sum basis.

B. Payment

1. Payment of the lump sum bid for Item B.19 shall be full compensation for furnishing all labor, materials, equipment, and shall include any other miscellaneous work required to install the 10-foot manhole and base (DMH 4-1) and 4-foot riser sections to grade as directed by Engineer, complete all pipe connections to the existing 42-inch Lowell Connector culvert and 12-inch drain pipe to the lengths as shown on the Drawings including excavation and backfill, maintenance of existing flows, dewatering, design, installation and later removal of excavation support, connecting the new 60-inch pipe to the manhole, furnishing and installing pre-cast manhole portion of the work, frame, cover and all related work as shown on the Drawings and specified herein. **Payment for this item will not include the excavation and backfill and installation of the 60-inch drain pipe. Payment for the 60-inch pipe shall be made under Items B.2a starting at the outside face of the 10-foot manhole.**

2. Payment of the lump sum bid for Item B.20 shall be full compensation for furnishing all labor, materials, equipment, and shall include any other miscellaneous work required to install the 4-foot manhole and base (DMH 4-2), and 4-foot riser sections to grade directed by Engineer, complete the pipe connection to the existing 24-inch drain, coring and installation of the 24 inch pipe connection to the 60-inch drain pipe, pipe connections to DMH 4-2, maintain existing flows, dewatering, installation and later removal of any trench support, furnishing and installing pre-cast manhole portion of the work, frame, cover and all related work as shown on the Drawings and specified herein.

3. Payment of the lump sum bid for Item B.21 shall be full compensation for furnishing all labor, materials, equipment, and shall include any other miscellaneous work required to install the 12-foot by 8-foot precast concrete structure and base (DMH 4-3), and 4-foot riser sections to grade as directed by Engineer, installation of the 5-foot diameter manhole (DMH 4-4), 36-inch connecting pipe between DMH 4-3 and DMH 4-4, complete all pipe connections to the existing 84-inch Lowell Connector culvert and 36-inch drain pipe to the lengths as shown on the Drawings including cleaning existing 36-inch drain connection (58 LF), excavation and backfill, structural fill, maintenance of existing flows, dewatering, design, installation and later removal of excavation support, connecting the new 60-inch pipe to the structure, furnishing and installing pre-cast manhole portion of the work, frame, cover and all related work as shown on the Drawings and specified herein. **Payment for this item will not include the excavation and backfill and installation of the 60-inch drain pipe. Payment for the 60-inch pipe shall be made under Items B.2a starting at the outside wall of the 8-foot x 12-foot structure.**

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3.20 MISCELLANEOUS WORK AND CLEANUP (Items A.22 and B.22)

A. Measurement

1. Miscellaneous work and cleanup shall be measured on a lump sum basis (Items A.22 and B.22).

B. Payment

1. Payment of the lump sum price bid in the Bid Form for Items A.22 and B.22, Miscellaneous Work and Cleanup, shall be full compensation for furnishing all labor, materials and equipment required to do all related work of this Contract as specified under Section 02901, or as shown on the Drawings and any other miscellaneous work not specifically included for payment under any other item, but obviously necessary to complete the Contract. There are some miscellaneous work items unique to Part A and Part B. Partial payments shall be based on the breakdown of the items as specified in Section 02901.

3.21 MOBILIZATION (Items A.23 and B.23)

A. Measurement

1. Measurement for payment of mobilization costs shall be on a lump sum basis (Items A.23 and B.23) but the cost shall not exceed 5 percent of the Total Bid Price excluding this item itself.

B. Payment

1. Payment of the lump sum price bid in the Bid Form for Items A.23 and B.23 shall be full compensation for all costs associated with initiating the Contract, exclusive of the cost of materials. Payment shall include compensation for all insurance, bonds, project sign, site preparation, furnishing of temporary facilities and in general the costs associated with establishing the work on site to assure that it is proceeding in a continuous manner.

END OF SECTION

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SECTION 01045

CUTTING, CORING AND PATCHING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section covers the cutting, coring, rough and finish patching of holes and openings in existing structures.

B. All cutting, coring, rough and finish patching shall be performed by the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for finish patching shall be equal to those of existing construction.

PART 3 EXECUTION

3.01 GENERAL

A. All cutting and coring shall be performed in such a manner as to limit the extent of patching.

B. All holes cut through concrete and masonry walls shall be core drilled unless otherwise approved. All holes to be cut or otherwise executed in stone and mortar, cobble, or brick wall shall be executed in a manner to minimize disruption to the existing wall. The structural integrity of all walls requiring penetration shall be maintained. No structural members shall be cut. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.

C. Finish patching shall match existing surfaces as approved.

3.02 CORING

A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.

B. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.

C. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

D. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

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3.03 CUTTING

A. Cutting shall be performed with a concrete wall saw and diamond saw blades of proper size.

B. Provide for control of slurry generated by sawing operation on both sides of wall.

C. When cutting a reinforced concrete wall, the cutting shall be done so as not 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.

D. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

E. Provide equipment of adequate size to remove cut panel.

3.04 OTHER

A. Contractor shall submit, in accordance with Section 01300, proposed method for providing holes in existing foundations for new pipe in stone and mortar, brick, and cobble foundations. Contractor shall not begin work prior to written approval from Engineer. Contractor shall be responsible for all damage (structural or other) caused by foundation penetration work.

END OF SECTION

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SECTION 01046

CONTROL OF WORK

PART 1 GENERAL

1.01 PLANT

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 ensure 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, Engineer 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 their obligations to secure the quality of the work and rate of progress required.

1.02 PRIVATE LAND

A. Do not enter or occupy private land outside of easements, except by written permission of the land owner and the Owner.

1.03 PIPE LOCATIONS

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

1.04 OPEN EXCAVATIONS

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at their 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. 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. As mandated by Chapter 82A of the Massachusetts General Law (MGL), the trench safety regulations require that all Contractors, whether public or private, take specific precautions to

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protect the general public and prevent unauthorized access to unattended trenches. Accordingly, unattended trenches must be covered, barricaded or backfilled. Covers shall be road plates at least ¾-inch thick or equivalent; barricades shall be fences at least 6-feet high with no openings greater than 4-inch between vertical supports; backfilling shall be sufficient to eliminate the trench. Alternatively, Contractors may choose to attend trenches at all times, for instances by hiring a police detail, security guard or other attendant who shall be present during times when the trench will be unattended by the Contractor. For purposes of this Paragraph, a "trench" shall be defined as an excavation which is narrow in relation to its length, made below the surface ground in excess of 3 feet below grade and the depth of which is, in general, greater than the width, but the width of the trench, as measured at the bottom, is no greater than 15 feet and the words "excavator", "excavation" and "emergency" shall have the same meanings as defined in Section 40 of Chapter 82 of the MGL. The word "excavator" as used in this Paragraph shall also mean "Contractor".

1.05 TEST PITS

A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled at the direction of the Engineer. 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.

1.06 MAINTENANCE OF TRAFFIC

A. Unless permission to close a street is received in writing from the proper authority, all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he/she shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.

B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, expedite construction operations and periods when traffic is being detoured will be strictly controlled by the Owner.

C. Take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. Be fully responsible for damage or injuries whether or not police protection has been provided.

D. Use of police for traffic control shall be in conformance with Massachusetts Bureau of Municipal Facilities Policy Memorandum No. CG-15 included in Part II of the Supplementary Conditions.

1.07 CARE AND PROTECTION OF PROPERTY

A. The Contractor shall be responsible for the preservation of all public and private property and 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/her expense, to a condition similar or equal to that existing before the damage was done, or he/she shall make good the damage in other manner acceptable to the Engineer.

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B. Contractor shall have a form letter in place for all homeowners that want to submit a damage claim. The Engineer will receive a copy of each homeowners damage claim. The contractor shall inform the Engineer in writing the status of each damage claim 30 days after submittal with their insurance company. Additional updates for each damage claim, every 30 days following the initial status update, will be submitted to the Engineer.

1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. 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. Carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him/her at his/her expense.

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 (culverts, water courses, storm drains, gas mains, water mains, cable TV, electric, telephone, gas and water services, etc) 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 prices bid for sewer pipe items in the Bid Form. This work shall include but is not limited to the following: bracing, hand excavation and backfill (except screened gravel), and any other work required for crossing the utility or obstruction.

D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the City of Lowell is required due to a direct invert conflict with the work of this Contract, they may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the prices bid for applicable pipe items, where applicable, or as extra work under Article 11 of the Supplementary Conditions where no applicable pipe item exists. If relocation of a privately owned utility is required, the City will notify the Utility to perform the work as expeditiously as possible. Fully cooperate with the City and Utility and shall have no claim for delay due to such relocation.

E. Notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way. Also notify Massachusetts Dig Safe, telephone 1-888-344-7233 at least 72 hours prior to start of work. The Owner operates the sewer and drainage systems and may be reached at 978-970-4248. Lowell Regional Water Utility operates the water system and may be reached at 978-970-4242. National Grid operates the natural gas system and may be reached at 1-800-548-8000. Verizon operates the telephone/communication system and may be reached at 978-275-1200. National Grid operates the electrical system and may be reached at 978-725-1473.

F. At pipe crossings and where designated by the Engineer, furnish and place crushed stone bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding

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shall extend to the mid-diameter of the pipe crossed. Payment for crushed stone at pipe crossings will be made according to the unit price established in the Bid Form.

G. Coordinate the removal and replacement of buried traffic loops and signals, if required for the performance of the work, at no cost to the Owner. .

1.09 WATER FOR CONSTRUCTION PURPOSES

A. In locations where public water supply is available, the Contractor may be allowed to use water without charge for puddling backfill and other construction purposes.

B. The express approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege of unrestricted use. Hydrants shall only be operated under the supervision of the Owner's personnel.

1.10 MAINTENANCE OF FLOW

A. The Contractor shall at their 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.

1.11 COOPERATION WITHIN THIS CONTRACT

A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and their 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.

C. At several locations (among them adjacent to University of Massachusetts Lowell properties), construction on other pipelines, buildings, or site renovations may be carried on during the same period as construction under this Contract. It will be necessary for the Contractor to plan his/her work and cooperate with the other contractor insofar as connections required to each other's work and to prevent any interference and delay for which he/she shall receive no other compensation.

A.12 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. During the course of the work, keep the site of operations in as clean and neat a condition as is possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition. Granite curbing that is removed during construction operations must be reinstalled within two months of pipe installation on each street. If curbing cannot be reinstalled within two month period, it must be moved from sidewalks and stored in an area suitable to the Owner and there after installed as soon as practicable. At the completion of the project, leave the entire work site in a neat and orderly condition.

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B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, 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 in other related Sections.

C. 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 or her will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

D. Dust control and street sweeping shall be executed in accordance with Specification Section 01562.

1.13 RESTORATION

A. Restore all areas to conditions that existed prior to construction. Restoration outside of the pipe trench limits required as a result of the installation of the pipeline shall be at the Contractor's own expense. Restoration within the pipe trench limits is included in the pipe items in the Bid Form.

B. Existing public and private driveways and sidewalks disturbed by the construction shall be replaced to the limits and thicknesses existing prior to construction.

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

D. Existing concrete, bituminous, timber or granite curbing shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension at the Contractor's expense. Granite curbing removed and reset shall conform to Section 580 of the Massachusetts DPW Standards. Joints between sections shall be pointed as required after resetting. Bituminous berms shall conform to Section 501 of the Mass DPW Standards.

E. The contractor is required to restore all lawns to a level grade, free and clear of all construction debris. Lawns and cross country areas shall be loamed and seeded in accordance with specification Section 02930.

END OF SECTION

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SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment and perform 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 Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.

C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. The work shall include, but not necessarily be limited to; providing erosion control measures such as installation of temporary access ways and staging areas, silt fences, stone filter boxes, diversion channels, sedimentation or filtration systems, stone filter berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, sediment removal and disposal, device maintenance, removal of temporary devices and final cleanup. All erosion control measures shall be in place in an area prior to any construction activity in that area.

D. This Section is 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 (MADEP). Prepare a sedimentation and erosion control plan meeting the requirements for approval by the Engineer. Upon approval, incorporate the Erosion and Sediment Control Plan into the Stormwater Pollution Prevention Plan.

F. Contractor shall apply for and obtain a General Permit for Construction Activities from EPA pursuant to the National Pollutant Discharge Elimination System (NPDES) program. Permit requires preparing and submitting a Notice of Intent (NOI) for Storm Water Discharges and Notice of Termination Form (both forms provided in the Appendix to the Specifications) and preparation of a Storm Water Pollution Prevention Plan (SWPPP). The NPDES, NOI and SWPPP shall include construction dewatering as well as construction storm water. A portion of the governing regulations is also provided in Section 01170.

G. Contractor shall follow the requirements of the Lowell Conservation Commission, ORDER Of CONDITIONS, appended to the Specification, for work in Part A Marginal Sewer Relief Pipe.

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The contractor shall obtain a separate Order of Conditions for the work on Part B that potentially affects River Meadow Brook for the cleaning of the 42-inch culvert under the Lowell Connector.

1.02 APPLICABLE REGULATIONS

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

1.03 NOTIFICATIONS

A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. 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.

1.04 IMPLEMENTATION

A. Prior to commencement of the work, the Contractor shall meet with the Engineer and Owner to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.

B Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off site areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered.

C. 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

3.01 EROSION CONTROL

A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to

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carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 PROTECTION OF RIVERS, STREAMS AND SURFACE WATERS

A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water 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. Divert such waters through a settling basin or filter before being directed into streams or surface waters.

B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels and shall meet the requirements of the NPDES Construction Dewatering Permit appended.

C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the MADEP. Submit two copies of approved contingency plans to the Engineer.

D. Water being flushed from structures or pipelines after disinfection, with a Cl_2 residue of 2 mg/l or greater shall be treated with a dechlorination solution, in a method approved by the Engineer, prior to discharge.

3.03 PROTECTION OF LAND RESOURCES

A. Restore land resources within the project boundaries and outside the limits of permanent work 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, do 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. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

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1. 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. Experienced workmen shall perform all trimming or pruning in an approved manner with saws or pruning shears. Tree trimming with axes will not be permitted.

2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer shall be immediately removed and replaced.

E. The locations of the Contractor's storage and other construction buildings required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by 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. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.

2. Details of temporary road construction.

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.

4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

G. 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 that will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as described in Section 02930, or as approved by the Engineer.

H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

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3.04 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 - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.

D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.05 NOISE CONTROL

A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

B. Make a visual inspection of all erosion and sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

3.07 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Re-grade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings.

END OF SECTION

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SECTION 01170
SPECIAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL OBLIGATIONS OF THE CONTRACTOR

A. General obligations of the Contractor shall be as set forth in the Contract Documents. Unless special payment is specifically provided in Section 01025, all incidental work and expense in connection with the completion of work under the Contract will be considered a subsidiary obligation of the Contractor and all such costs shall be included in the appropriate items in the Bid Form in connection with which the costs are incurred.

1.02 SITE INVESTIGATION

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

1.03 COORDINATION WITH LOCAL AGENCIES

A. Supply the Local Police Department, Fire Department, School Department, Conservation Commission and the Lowell Regional Wastewater Utility (LRWWU) with the following information.

1. A list of streets and intersections where work will be in progress to be supplied at intervals as required by the Engineer.

2. Areas where approved detours are in effect.

3. Immediate notification of any drain, gas or water main breaks.

B. Reimburse the Owner for the actual cost of the services of Water Department Personnel required during other than regular working hours. The emergency contact number for the Water Department during non-business hours is (978) 674-4242.

C. Maintain pavement as specified in Division 2 and provide the LRWWU with an address where the Contractor may be reached when not at the site. Upon notification by the Owner or the Engineer, promptly make such repairs as necessary to paved surfaces.

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1.04 PUBLIC UTILITIES

A. Comply with the requirements of the Commonwealth of Massachusetts Statute - Chapter 82, Section 40, for excavations in public and private property. Compliance shall include the following:

1. Notify public utility companies in writing at least 72 hours (excluding Saturdays, Sundays and legal holidays) but not more than 30 days before excavating in areas where underground utility plant (pipes, cables, manholes, etc) exist.

2. Provide the Utility Companies with a schedule of the activities in areas where the utilities exist.

3. Notify utility companies of any damage to their utilities resulting from construction operations.

B. Notify DIGSAFE at 1-888-344-7233 at least 72 hours before digging, trenching, blasting, demolishing, boring, backfilling, grading, landscaping or other earth moving operations in any public ways, rights of way and easements.

1.05 PROGRESS SCHEDULE

A. Submit a progress schedule before starting any work, in accordance with Article 2.05B of the General Conditions.

B. Review the progress schedule with the Engineer on a monthly basis or more frequently as required by the Engineer. The progress schedule shall be adjusted as required in accordance with the General Conditions.

C. Project specific schedule requirements are included in Section 01010.

1.06 PROGRESS MEETINGS

A. The Engineer shall coordinate monthly progress meetings at the site on a regular day and time. The Owner, Engineer and Contractor shall attend these progress meetings to discuss work progress, schedule and other issues required by the Engineer.

1.07 PROVISIONS FOR CONTROL OF EROSION

A. Portions of the work, potentially impact upon restricted wetland areas. Comply with the "ORDER OF CONDITIONS" appended to this Specification.

B. Take sufficient precautions during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens and calcium chloride into the supplies and surface waters of the State. Special precautions shall be taken in the use of construction equipment to prevent operations which promote erosion.

C. Disposal of drainage shall be in an area approved by the Owner. Prevent the flow or seepage of drainage back into the drainage area. Drainage shall not be disposed of until silt and other

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sedimentary materials have been removed. Particular care shall be taken to prevent the discharge of unsuitable drainage to a water supply or surface water body.

D. As a minimum, the following shall apply:

1. In cross country areas brush and stumps shall not be removed until no more than 1 week prior to the start of pipe laying in that area. The existing ground surface shall be disturbed as little as possible until no more than 1 week prior to the start of pipe laying.

2. Staked bales of hay and/or silt fence shall be provided at points where drainage from the work site leaves the site, to reduce the sediment content of the water. Sufficient bales of hay shall be provided such that all flow will filter through the hay. Other methods which reduce the sediment content to an equal or greater degree may be used as approved by the Engineer.

3. Drainage leaving the site shall flow in a manner to prevent erosion.

4. Loaming and seeding or mulching of cross country areas shall take place as soon after laying of the pipeline as practicable. This shall be considered part of the pipeline work and full payment for the pipeline work may not be made until it has been completed.

E. Measures for control of erosion shall be adequate to assure that turbidity in the receiving water will not be increased more than 10 standard turbidity units (s.t.u.), or as otherwise required by the State or other controlling body, in waters used for public water supply or fish unless limits have been established for the particular water. In surface water used for other purposes, the turbidity shall not exceed 25 s.t.u. unless otherwise permitted.

F. When excavating in wetlands or a river floodplain, where no temporary diversion structure is required, place the excavated material on the uphill side of the trench so that the trench serves as a barrier between the excavated material and the wetland or flood plain.

1.08 PERMITS

A. Obtain all necessary permits required for proper execution of the project. Fill out all forms and furnish all drawings required to obtain the permits. A copy of each permit shall be submitted to the Engineer. All fees associated with these permits shall be paid by the Contractor as part of the work. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.

B. Obtain required street opening permits for excavations within streets or sidewalk areas. Separate street opening/trench permits will be required for work on each individual street. Fees for City of Lowell street opening/trench permits are waived under this Contract.

C. Obtain and abide by all permit requirements imposed by the NPDES Construction Dewatering Permit and Stormwater Permit for Construction Activities.

D. Abide by any permit requirements imposed in the wetlands Order of Conditions appended, for work on Part A.

E. The Contractor shall obtain a separate Order of Conditions to complete work on the cleaning of the 42-inch culvert under Part B.

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1.09 CONTRACTOR'S USE OF PREMISES

A. Contractor shall maintain one lane of traffic at all times and shall limit the use of the premises for their work for storage to allow for:

1. Work by other contractors

2. Access of public to homes

3. Public use.

4. Fire Protection

B. Contractor shall assume full responsibility for security of all their subcontractor's materials and equipment stored on the site.

C. If directed by the Engineer, move any stored items that interfere with operations of Owner or other contractors.

D. Obtain and pay for use of additional storage or work areas if needed to perform the work.

1.10 ASBESTOS CEMENT (AC) PIPE ABATEMENT REQUIREMENTS

A. When required, the Contractor shall enlist the services of a subcontractor that is licensed in the Commonwealth of Massachusetts to perform asbestos abatement. All work associated with the handling and disposal of asbestos cement pipe shall be conducted by the licensed subcontractor.

B. The Subcontractor shall comply with all laws, ordinances, codes, rules and regulations of the local, state and federal authorities including the requirements of 29 CFR, Part 1910 and 1926; 40 CFR, Part 61 and 763.

C. The Subcontractor shall execute all notifications and manifests, and obtain all permits and licenses for removing, handling and disposing of the AC pipe, when encountered, that is required to perform the new work.

D. The Subcontractor will not be allowed to saw cut any existing AC pipe. The collar at each joint shall be removed and then the section of the pipe shall be removed from the trench without disturbing the AC pipe to remain in service.

E. The Subcontractor shall submit to the Engineer the following items prior to performing the work associated with asbestos cement pipe.

1. Submit a copy of the Subcontractors licenses to perform asbestos abatement work.

2. Submit a copy of training certificates and certification for each worker.

3. Submit the OSHA medical surveillance documents conducted within the last 12 months for each worker.

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4. Submit the plan describing the method for performing air monitoring and sampling to be in compliance with the OSHA Asbestos Standards.

5. Submit the name, address and applicable license from the transporter and the landfill that will handle and dispose of the asbestos cement pipe.

F. Payment for differing site conditions shall be paid for in accordance with the General Conditions.

1.11 WEATHER PROTECTION

A. In the event of inclement weather, the Contractor shall protect the Work and materials from damage or injury from the weather. If, in the opinion of the Engineer, any portion of the Work or materials has been damaged by reason of failure on the part of the Contractor to so protect the Work, such Work and materials shall be removed and replaced with new materials and Work to the satisfaction of the Engineer.

END OF SECTION

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Product Data, Samples, Request for Information, Pre- and Post-Construction Video Taping, Record Drawings, and Construction or Submittal Schedules. Additional general submission requirements are contained in Article 6.17 of the General Conditions. Detailed submittal requirements are specified in the technical Sections.

B. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled 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 work.

2. All shop drawings submitted by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. Check all subcontractor's shop drawings regarding measurements, size of members, materials and details to make sure that they conform to the intent of the Drawings and related Sections. Return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission thereof.

4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

B. Product Data

1. Product data as specified in individual Sections include, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances 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

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and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples specified in individual Sections include, 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.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. 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 related Sections

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 Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.

C. The Contractor shall utilize a 10-character submittal identification numbering system in the following manner:

1. The first character shall be a D, S, P or M which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P) or Operating/ Maintenance Manual (M).

2. The next five digits shall be the applicable Section Number.

3. The next three digits shall be the numbers 001 to 999 to sequentially number each initial separate item or drawing submitted under each specific Section Number.

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4. The last character shall be a letter, A to Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

D-03300-008-B

D	= Shop Drawing
03300	= Section for Concrete
008	= The eighth initial submittal under this section
B	= The second submission (first resubmission) of that particular shop drawing

D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

E. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.

F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other contractor.

B. Each submittal, appropriately coded, will be returned within 30 calendar days following receipt of submittal by the Engineer.

C. Number of submittals required:

1. Shop Drawings: Six copies.

2. Product Data: Three copies.

3. Samples: Submit the number stated in the respective Sections.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

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3. Contractor identification.

4. The names of:

   a. Contractor
   b. Supplier
   c. Manufacturer

5. Identification of the product, with the 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 Standards numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8-in by 3-in blank space for Contractor and Engineer stamps.

12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

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

A. The review of shop drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:

   1. As permitting any departure from the Contract requirements;

   2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

   3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.

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D. Submittals will be returned to the Contractor under one of the following codes.

1. "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.

2. "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

3. "APPROVED AS NOTED/CONFIRM" - This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. The Contractor may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.

4. "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

5. "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.

6. "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Contractor.

7. "RECEIPT ACKNOWLEDGED" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer’s review and approval; and, is being filed for informational purposes only. This code is generally used in acknowledging receipt of *means and methods of construction* work plan, field conformance test reports, and Health and Safety plans.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

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F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor and will be considered "Not Approved" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

G. Repetitive Review

1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.

2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

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 7 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.

1.06 DISTRIBUTION

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

1.07 REQUESTS FOR INFORMATION

A. When the Contractor believes that additional information or clarification of a contract requirement is needed, it may initiate a Request for Information (RFI).

B. RFIs may relate to Technical matters or Administrative matters. The RFI process shall be limited to the clarification of technical and/or administrative matters. While the response to an RFI might lead to a change in the contract scope, cost or time, RFIs are not a substitute to the notification requirements stipulated in the General Conditions.

C. A response to an RFI may authorize minor changes to the contract consistent with the terms of the contract related to the responsibilities and limitations of authority of the Engineer.

D. A response to an RFI is not an authorization to perform any additional work that would require that change order or written amendment to the contract. If the Contractor believes the response an RFI requires a change to the contract, Contractor shall promptly provide written notice to the Owner and Engineer in accordance with the General Conditions.

E. RFIs are not a substitute for the Submittals process specified elsewhere.

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1.08 PRE- AND POST-CONSTRUCTION VIDEO

A. Prior to the excavation in any street or cross-country area, the Contractor shall employ the services of a professional firm to document existing conditions using a video recorder. The video recordings shall be in DVD format, or approved equal.

B. At the completion of the project, the Contractor shall employ the services of a professional firm to document existing conditions using a video recorder. The video recordings shall be in DVD format, or approved equal.

C. The video recordings shall be of sufficient detail to accurately and clearly show the existing, preconstruction conditions of the entire work area. Each tape shall be accompanied by an audio description of the area being video taped. Special attention shall be given to areas which could be involved in disputes after completion of construction.

D. Each DVD shall be labeled with the followings:

1. Contractor's name

2. Name of Project

3. Short Description of View

4. Tape No. and Date Made

5. Name of Person Making Tape

E. Prior to the commencement of work, two copies of the DVDs shall be turned over to the Engineer. The original tapes shall be retained in a secure location by the Contractor throughout the duration of the project and shall then be turned over to the OWNER.

F. The Contractor shall provide as a minimum, a 19-inch color television and DVD player in order to view video tapes, as required, during the progress of the work.

1.09 RECORD DRAWINGS

A. The Contractor shall annotate (mark-up) the Contract Drawings to indicate all project conditions, locations, configurations, and any other changes or deviations that vary from the original Contract Drawings. This requirement includes, but is not limited to, buried or concealed construction, and utility features that are revealed during the course of construction. Special attention shall be given to recording the locations (horizontal and vertical) and material of all buried utilities that are encountered during construction – whether or not they were indicated on the Contract Drawings. The record information added to the drawings may be supplemented by detailed sketches, if necessary, clearly indicating, the WORK, as constructed.

B. These annotated Contract Drawings constitute The Contractor's Record Drawings and are actual representations of as-built conditions, including all revisions made necessary by change orders, design modifications, requests for information and field orders.

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C. Record drawings shall be accessible to the Owner and Engineer at all times during the construction period.

1.10 SCHEDULES

A. Provide all schedules required by Articles 2.05, 2.07, 14.01, and elsewhere in the General Conditions.

1.11 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

1.12 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 of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

END OF SECTION

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P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the Commonwealth of Massachusetts and that he/she has been employed by

_____ to design
(Name of Contractor)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the

___Marginal Sewer Relief Pipe_____.
(Name of Project)

The undersigned further certifies that he/she has performed the said design in conformance with all applicable local, state and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

_____
(Insert Name of Owner)

or Owner's representative within seven days following written request therefor by the Owner.

_____	_____
P.E. Name	Contractor's Name
_____	_____
Signature	Signature
_____	_____
Address	Title
	_____
	Address

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SECTION 01500

TEMPORARY FACILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials, and incidentals necessary and provide separate temporary facilities for the Contractor's use and the Engineer's use, as specified herein and as shown on the drawings.

B. Operate and maintain temporary facilities for the duration of the project and as directed by the Engineer. All cost and use charges for temporary facilities shall be included in the Contract Price.

1.02 RELATED WORK

A. Control of Work is included in Section 01046.

B. Miscellaneous Work is included in Section 02901.

C. Special Provisions is included in Section 01170.

1.03 SUBMITTALS

A. Submit shop drawings and product data, in accordance with Section 01310, showing materials of construction and details of installation for:

1. Site Plan: Show the proposed locations for temporary facilities including offices, temporary utilities, storage containers/buildings, vehicle access and parking areas, material laydown and staging areas, temporary fencing, and other security measures.

2. Engineer's Field Office: Dimensioned floor plan, office systems, furnishings, and equipment.

3. Temporary Fence: Layout drawings which indicate dimensions, access to fire hydrants, gate locations and opening sizes, and other site specific requirements.

4. Project Sign: Layout, graphics, and wording.

B. Submittals shall be received by the Engineer no later than the date of the Preconstruction Meeting.

1.04 QUALITY ASSURANCE

A. Temporary facilities shall comply with all applicable state and local ordinances, codes and regulations.

B. Coordinate with authorities having jurisdiction to inspect (and test if required) temporary facilities.

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C. Obtain all required permits for temporary facilities.

1.05 DEFINITIONS

A. Duration of the project: The period of time from the date of the Notice to Proceed to the date of Final Completion, inclusive.

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Fence: Fabric shall be No. 9 gauge galvanized wire woven in 2-in diamond mesh with top and bottom twisted selvage. Intermediate and terminal posts shall be galvanized steel H or pipe, minimum 2-3/8-in OD line posts, 2-7/8-in OD corner and pull posts, and 1-5/8-in OD top rails.

B. Project Sign: Plywood shall be A-A EXT-APA grade, 1-in thick. Posts and braces shall be pressure treated lumber.

2.02 EQUIPMENT

A. Fire Extinguishers: Provide portable, UL-rated with class and extinguishing agent required by locations and classes of fire exposure. Provide at least one for each trailer/office.

B. Temporary Heat: Provide vented, self-contained, liquid propane gas or fuel oil heaters with individual space thermostatic control. Equipment shall be listed and labeled for type of fuel consumed and marked for intended use.

2.03 ENGINEER'S FIELD OFFICE

A. Provide minimum 12-ft by 50-ft office trailer for the Engineer's exclusive use for the duration of the project. Field office trailer shall have at least one office, one conference room, one bathroom, one closet, and two exterior doors.

B. The bathroom shall include toilet, sink and faucet, medicine cabinet and mirror, toilet tissue holder, paper towel holder, incandescent light fixture, and five gallon capacity water heater, and exhaust fan and the bathroom door shall be lockable.

C. The conference room shall include built-in plan table.

D. The ENGINNER's field office shall be weather-tight construction with floor, walls, and ceiling completely insulated. Each room shall have at least one operating window, thermopaned glazed, and be provided with screens and venetian blinds. Ceiling shall be 8-foot high with acoustical tiles. Interior walls shall be 3/8-inch architectural wooden panels. Each window shall have a venetian blind and full insect screen. Exterior doors shall be provided with Medco lock systems (or equal), keyed alike (provide three sets of keys), and welded security bar with padlock. Provide fully insulated skirting on all sides of the field office trailer. Provide steps, platforms, handrails, and boot scrapers for each exterior door.

E. Field office trailer shall be Mobile Mini, ModSpace, Williams Scotsman, or equal. Converted storage or box containers will not be acceptable.

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F. Furnishings

CONTRACTOR shall provide the following furnishings for the Engineer's temporary field office for the duration of the project. All furnishings shall be new – or in very good condition – subject to approval of the Engineer.

a. One 72-inch by 36-inch desk with file drawer and 5 drawers, all lockable, upholstered swivel type chair with arms.

b. Two 60-in by 30-in desks with file drawer and 5 drawers, all lockable, upholstered swivel type chair with arms for each desk.

c. One 60-inch by 36-inch drafting table with drawer and stool.

d. One 30-in by 84-in conference table

e. Twelve armless side chairs (stacking type)

f. Two 54-in by 30-in folding tables

g. Six file cabinet, 4 drawer, legal size, Hon No. HN-315C, or equal

h. Four wastebaskets

i. One rolling plan storage rack, 10-stick capacity

j. One lockable storage cabinet, 72-in high, 36-in wide, and 18-in deep

k. Three fire extinguishers, disposable, dry-chemical, 40 oz, Type A, B, C

l. Two steel bookcase units, 4 shelves high, Hon No. HN-S48 ABC, or equal

m. One digital telephone answering machine

n. 24 painted steel coat hangers

o. One electric bottled water dispenser with hot and cold outlets and refrigerator unit. Adequate water bottles shall be provided (and paid for by the Contractor) until Final Completion

p. One coat stand

q. One wall-mounted first aid kit, McMaster-Carr 9501T1 or equal

r. One smoke detector per room, with batteries

s. Two dry erase boards, aluminum frame, 36-in by 60-in, markers and eraser, Quartet Model No. TS-S 535 or equal

t. One 1000-watt minimum 1.4-cuft microwave oven

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u. One 6-cf refrigerator

v. Commercial duty cross-cut shredder with basket, designed for 3 to 5 users, Fellowes Powershred SB-125i, or equal

w. One first aid kit, OSHA (1910.151.b) and ANSI (Z308.1-2003) compliant, suitable for ten people.

G. Equipment

1. CONTRACTOR shall provide the following equipment for the Engineer's temporary field office for the duration of the project. All equipment shall be new.

a. A multifunction digital color laser Photocopier, printer, facsimile and scanner, capable of multi-networked connections (wireless).

1) With 50-sheet auto-feeder, capable of copying and printing

2) Letter-sized, legal-sized, and 11x17-inch documents.

3) Contractor to provide paper and ink cartridges, as required, for the duration of the project.

b. Answering machine with digital recorder.

c. Digital Camera: provide one new digital camera for the Engineer's use for the project duration. Camera shall be a major brand name (e.g., Minolta, Cannon, Olympic, Pentax, etc. – subject to the Engineer's approval) and shall have an automatic date function, 12 Mega pixel or greater, 3x optical zoom or better, and at least two GB of memory (on board or supplemental memory card). The camera shall come complete with carrying case, storage card, rechargeable batteries, battery charger, flash memory reader, USB cables and all necessary software. After completion of project the camera will become the property of the Owner.

d. Four 8-outlet surge protectors with six foot cord and minimum 1800-joule energy rating or greater; as manufactured by Belkin, or equal.

e. One 12-cup coffeemaker with timer, by Krups, or equal.

H. Services

1. Provide the following services for the duration of the project. Services shall include all costs for installation, use, maintenance, and removal of all products, services and equipment billed by each provider for each service specified herein.

2. Field office shall have complete and fully functional electrical, plumbing, and HVAC systems. Provide at least two smoke detectors hard-wired into the electrical system. Perform all scheduled and unscheduled maintenance for all systems and as directed by the Engineer.

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3. Electrical System: Provide connection to temporary electric service. Comply with the electrical requirements of the furnished office trailer. Provide main circuit panel, sufficient GFCI outlets and lighting in each room, exterior lights at each exterior door, and proper grounding of entire electrical system. Lighting shall be provided by fluorescent ceiling fixtures furnishing 20 foot-candles at desk height, uniform throughout. Each room shall be provided with a wall switch for ceiling fixtures.

4. Plumbing system: Connect to existing potable water supply. Provide hot water heater and hot and cold water to each fixture. Connect waste pipes to existing sanitary system or a waste holding tank. Heat trace and insulate exterior piping to prevent freezing. Where potable water service is not available, Contractor shall provide bottle water service with water chiller/dispenser.

5. HVAC System: Provide central heating and air conditioning system with programmable thermostat. System shall be capable of maintaining an interior temperature of 70°F when the exterior temperature is 0°F and an interior temperature of 75°F when the exterior temperature is 100°F.

6. Bottled water service: Provide bottled water service complete with dispenser with hot and cold water taps and regular bottle and cup replenishment as directed by the Engineer.

7. Janitorial service: Provide janitorial services (at least weekly) that include dusting, sweeping, vacuuming, mopping, disinfection, and trash removal.

8. Sanitary service: Provide regular pumping of waste holding tank, if applicable, as needed.

9. Communications

    a. Install two telephone lines in the Engineer's field office for the Engineer's exclusive use:

        1) one voice grade line with caller ID and call-waiting features

        2) two additional second lines, one voice grade for the facsimile/answering machine and one DSL line for the wireless router. Each office to be supplied with one telephone line. The conference room to be provided with at least two telephone lines.

        3) Provide one – 5.8 GHz cordless phone with answering machine, Panasonic Model KX-TG5571M or equal with three additional handsets, with speaker phone.

    b. Provide up to three cellular phone(s) for the duration of the project for the use of the Engineer's use. Include unlimited service plans, with long distance service for each unit, including voice mail and text messaging service. Provide chargers both office and vehicle for each unit. Provide holsters for each unit.

    c. Provide, for the Engineer's use, four two-way radios with a minimum range of two miles, with chargers.

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10. Internet Access

    a. Provide a high-speed DSL data line or T1 cable line with internet access for the duration of the project.

    b. The trailer shall be supplied with one wireless router, Linksys WRT150N Wireless-N Home Router, or equal, and corresponding Broadband access service agreement. Two hours of installation assistance to be provided by a qualified technician.

    c. The trailer shall be supplied with three (1) Verizon Wireless AirCard® 595U USB Modem devices and corresponding service agreements for 30 months. The devices shall be compatible with the lap top computers specified by the Engineer. Coordination shall be made with the Engineer to provide appropriate devices and service agreements.

11. Pay all costs for installation, maintenance, and removal of the telephone and internet service and instruments, including cellular phone service. The monthly cost of all calls made and received by the Engineer, including toll and long distance calls, shall be paid for by the Contractor for the duration of the project.

I. Supplies: Provide the following supplies for the duration of the project: copy paper, toner, toilet paper, paper towels, soap, light bulbs, and other consumables as required by the Engineer.

J. Insurance

1. The CONTRACTOR or the CONTRACTOR'S leasing company shall provide fire insurance, extended coverage and vandalism, malicious and burglary and theft insurance coverage for the ENGINEER's office and contents in the amount of $100,000. Provide proof of coverage.

PART 3 EXECUTION

3.01 ENGINEER'S OFFICE

A. Engineer's trailer shall be set up and ready for occupancy within 30 days of the Notice to Proceed and prior to commencement of Work at the site. All systems, furnishings, equipment, and services specified herein shall be furnished, installed, and completely operational for the field office to be considered established.

1. Provide regular office cleaning services for the duration of the project.

2. Provide supplies including, but not limited to restroom supplies (toilet tissue paper, paper towel, and soap), as well as light bulbs, air conditioner filters, etc.

3. Provide office supplies for printers and fax machines, etc.

4. Supply all fuel for heating and pay all utility bills.

B. Install field office plumb and level.

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C. Engineer's trailer shall be removed and the site shall be cleaned up and restored before Final Completion of the project.

3.02 CONTRACTOR'S FIELD OFFICE

A. Provide a temporary field office(s) for the Contractor's use for the duration of the project. An authorized representative of the Contractor shall be present at all times while the Work is in progress. Instructions received at the Contractors field office from the Engineer shall be considered delivered to the Contractor.

B. Locate field office(s) in accordance with approved shop drawings and as directed by the Owner.

C. Establish and occupy field office within 30 days of the Notice to Proceed, unless otherwise approved by the Engineer or Owner.

3.03 TEMPORARY POWER AND LIGHT

A. Contractor shall furnish temporary light and power, including 220 Volt service for welding, complete with wiring, lamps and similar equipment as required to adequately light all work areas and with sufficient power capacity to meet the project needs. Make all necessary arrangements with the local electric company for temporary electric service and pay all expenses in connection therewith.

B. Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 Volt plugs into higher voltage outlets. For connection of power tools and equipment, provide outlets equipped with ground-fault circuit interrupters, reset button and pilot light.

C. Provide grounded extension cords. Use heavy duty cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if more than one length is required.

D. Provide general service incandescent lamps as required for adequate illumination. Provide guard cages or tempered glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

3.04 TEMPORARY HEAT

A. Provide heat as may be necessary for thawing out and heating the ground or materials and for proper execution, protection and drying-out of the Work.

3.05 WEATHER PROTECTION

A. Contractor shall furnish, install and maintain temporary heat and enclosures to provide adequate working areas for personnel during the cold weather months.

B. The Contractor shall furnish temporary heating units (UL or FM listed) to maintain reasonable temperatures within temporary enclosures.

C. Weather protection shall comply with M.G.L. Chapter 149 Section 44G.

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3.06 CONSTRUCTION AIDS

A. Provide temporary elevators, hoists, cranes, scaffolding and platforms as necessary to perform the Work. Provide temporary stairs where ladders are not adequate. Protect permanent stairs from damage from construction operations.

3.07 VEHICLE ACCESS AND PARKING

A. Provide temporary access roads, parking areas, traffic control devices and staging areas as approved by the Engineer and Owner.

B. Provide minimum 12-ft by 24-ft by 6-in deep dense graded crushed stone or paved parking area adjacent to Engineer's field office for exclusive use by the Engineer for the duration of the project.

C. Clear snow and ice from all drives, walks, and stairs to maintain safe vehicle and pedestrian access to the site and facilities as directed by the Engineer.

3.08 TEMPORARY FENCE

A. Provide temporary fence as shown on the Drawings, as specified herein, and as the Contractor requires for site security.

1. Provide 6-ft high chain link fence with at least two vehicle and two pedestrian access gates. Gates shall be equipped with locking hardware and padlocks. Furnish two sets of keys to Engineer and Owner. Coordinate with local first responders for access during non-work hours.

2. Fence installation shall comply with ASTM F567. Post spacing shall not exceed 8-ft on center. Posts shall be set plumb in concrete footings.

3. Perform daily inspections of fence and immediately repair or replace damaged or compromised sections and as directed by the Engineer.

3.09 WASTE MANAGEMENT

A. Provide covered dumpster, minimum 4-cubic yards, dedicated for field office waste. Provide separate covered dumpster of adequate size for construction debris. Empty dumpsters on a regular basis and as directed by the Engineer. Dumpsters shall not exceed their capacities at any time.

3.10 PROJECT SIGNS

A. Furnish and install the project signs indicated in the Contract Documents. Signs shall be placed as directed by the Engineer; and, shall remain maintained in good condition for the life of the construction period.

B. Remove signs at final acceptance, unless otherwise directed.

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3.11 REMOVAL AND RESTORATION

A. Remove each temporary facility complete when need for its service has ended and as approved by the Engineer. Coordinate removal of temporary facilities with authorities having jurisdiction.

B. Restore all improvements damaged by the installation, operation, and removal of the temporary facilities. Obtain prior approval from Owner and Engineer for restoration work. Comply with the restoration requirements of Section 01046.

END OF SECTION

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SECTION 01510

MAINTAINANCE OF FLOW IN EXISTING SEWERS AND DRAINS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Contractor shall be responsible for maintaining wastewater and storm drainage flow in all public and private pipes during construction including individual house service connections. The Contractor shall man all bypass pumping systems during non-working hours, 7 days per week.

B. Provide all labor, equipment, power and materials necessary to maintain flow in existing sewers (including individual house services), drains and manholes, and handle existing wastewater and stormwater flows. Construct and maintain all temporary bypass sewers and drains and be responsible for all bypass pumping of sewage and drainage that may be required to prevent backing up of sewage or drainage during installation of all new pipe and manhole and catch basin structures and to allow proper inspection and testing of the new Work. The Contractor shall immediately remove and dispose of all offensive matter spilled during the bypass pumping at his own expense. Note that some drains have a continuous base flow and some sewers are force mains, which must be handled.

C. When bypass pumping is required, the Contractor shall supply pumps, conduits, power, and other equipment to safely divert the flow of sewage or drainage around the section in which work is to be performed. The design, installation and operation of temporary bypass pumping systems shall be the Contractor's responsibility. The bypass system shall be of sufficient capacity to handle existing flows plus additional flows that may occur during a rain event. The Contractor shall determine the minimum bypass system capacity for each street assuming non-surcharged full pipe flow and manning coefficient of n=0.013 and using the existing pipe sizes and inverts shown on the plans. The average dry weather flow of the Marginal Street Interceptor is approximately 0.3 million gallons per day (MGD).

D. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. Standby pump(s), of equal or greater capacity than the largest pump utilized, shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.

E. Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of work.

F. The Contractor shall be required to repair at his own expense any damage to property, public or private, caused by his operations.

G. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers; damage to sewer and that will protect public and private property from damage and flooding.

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H. Wastewater flows from existing sewers shall not be allowed to enter the new facilities, unless specified or approved by the Engineer, until the new facilities have been cleaned and tested as required in the Specifications.

I. Should damage of any kind occur to the existing drains or sewers, the Contractor shall at his own expense make repairs to the satisfaction of the Engineer.

J. The Contractor shall not be permitted to overflow, bypass, pump or by any other means convey drainage to any brook or water course without permission of the Engineer.

K. Work area open trenches for sewer pipe shall not be used for bypassing flows. Work area open trenches for drainage pipe shall not be used for bypassing flows, unless otherwise directed by the Engineer.

L. Sewage shall be bypassed only to existing sewers, as directed by the Engineer.

M. The Contractor shall perform leakage and pressure test of the bypass pumping discharge piping using clean water prior to actual operations. The Engineer will be given 24-hour notice prior to testing.

N. The Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipeline. The Contractor shall locate his bypass pipelines to minimize any disturbances to existing utilities and shall obtain approval of the pipeline locations from the City and the Engineer. The Contractor shall pay all costs associated with relocating utilities and obtaining all approvals.

O. The installation of the bypass pipelines is prohibited in all wetland areas. The pipeline must be located off streets and sidewalks and on shoulders of the roads. When the bypass pipeline crosses local streets and private driveways, the contractor must place the bypass pipelines in trenches and cover with temporary pavement. Upon completion of the bypass pumping operations, and after the receipt of written permission from the Engineer, the Contractor shall remove all the piping, restore all property to pre-construction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways from the City.

P. The pumping equipment shall be complete with sound attenuation enclosures to meet local standards.

Q. The Contractor shall remove all temporary pumping equipment and restore the area after the system is no longer required.

1.02 SUBMITTALS

A. All procedures for maintaining flows must meet the approval of the Engineer and the Contractor shall be required to submit to the Engineer, for approval, a detailed written plan of all methods of flow maintenance ten (10) days in advance of flow interruption, in accordance with Section 01300.

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B. The plan shall include but not limited to details of the following:

1. Number, size, material, location and method of installation of suction piping;

2. Number, size, material, method of installation and location of installation of discharge piping;

3. Bypass pump sizes, capacity, number of each size to be on site and power requirements;

4. Standby power generator size, location;

5. Downstream discharge plan;

6. Calculations for selection of bypass pumping pipe size;

7. Schedule for installation of and maintenance of bypass pumping lines;

8. Plan indicating location of bypass pumping line.

9. Sound attenuation to meet local standards

C. Submit name(s) of proposed restoration/cleanup companies to be used in the event of sewer backups into homes or businesses caused by Contractor work operations.

1.03 RELATED WORK

A. Submittals are included in Section 01300.

B. Connections to and work on the existing gravity system is included in Section 02658.

END OF SECTION

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SECTION 01562

DUST CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Perform dust control operations in an approved manner, whenever necessary or when directed by the Engineer, even though other work on the project may be suspended. Dust control shall be generally accomplished by the use of water, however calcium chloride shall be used in liquid form to provide prolonged control of nuisance dust.

B. Methods for controlling dust shall meet all air pollutant standards as set forth by Federal and State regulatory agencies.

C. Liquid calcium chloride shall be mixed to concentrations as recommended by the manufacturer and applied at their recommended rate.

1.02 RELATED WORK

A. Pavement Repair and Resurfacing is included in Section 02576.

1.03 SUBMITTALS

A. The Contractor shall submit to the Engineer, in accordance with Specification Section 01300, the product data from the manufacturer of the calcium chloride and application method proposed for use during construction. Information on recommended concentrations for dust control as well as application rates shall be included.

B. The Contractor shall submit a plan showing the process for mixing liquid calcium chloride if it will be mixed on site.

C. The Contractor shall submit to the Engineer their proposed method for application of the liquid calcium chloride.

PART 2 PRODUCTS

2.01 MATERIALS

A. Liquid calcium chloride shall conform to AASHTO M144 except the requirements for total alkali chlorides and other impurities shall not apply.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor will be allowed to mix the calcium chloride on site but will be required to maintain the mixing area in a neat and orderly condition. Provisions shall also be made to prevent high concentrations of calcium to migrate beyond the mixing area.

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3.02 DUST CONTROL

A. Liquid calcium chloride shall be applied at a uniform rate by mechanical means or as approved by the Engineer.

3.03 STREET SWEEPING

A. The Contractor shall thoroughly sweep the road surface in all work areas daily to mitigate the effects of nuisance dust.

B. The Contractor shall mobilize a street sweeper, at least once a week, to perform sweeping of roadways of active construction within the project area. When directed by the Engineer additional street sweeping shall be required.

END OF SECTION

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SECTION 01570

TRAFFIC REGULATION

PART 1 GENERAL

1.01 REQUIREMENTS

A. The Contractor shall furnish, install, operate and maintain equipment, services and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow during construction.

B. The Contractor shall submit to the Engineer a traffic plan detailing all temporary changes in traffic control equipment, street or road closures, detours, etc. The plan shall address the coordination with other contractors working within the area of work. No work shall commence until this plan has been reviewed an approved by the Lowell Public Works and Lowell Regional Wastewater Utility. After approval, copies of this plan shall be submitted to the Owner, Engineer, Police Department, Fire Department, Lowell Regional Transit Authority, University of Massachusetts Lowell, and Lowell School Department. The Contractor shall make every effort to adhere to this plan. When necessary, the Contractor shall update this plan and forward these changes to the Engineer and the City agencies for approval. The Owner reserves the right to modify the plan through the course of the Contract.

C. A traffic control plan shall be prepared by an Engineer with experience in designing traffic control plans. The traffic engineer shall meet with the Engineer, Lowell Public Works and Lowell Regional Wastewater Utility to determine requirements of traffic control plan and obtain approval of the plan.

D. The Contractor shall remove temporary equipment and facilities when no longer required and restore grounds to original or to specified conditions.

E. The Contractor shall notify all property owners in writing at least 48 hours in advance of any work that will interfere with access to their residence or place of business.

F. No road shall be closed to traffic without the prior consent of the Engineer, the Lowell Public Works, Lowell Regional Wastewater Utility and the Lowell Police Department.

G. Traffic control, including but not restricted to signing and devices, shall be provided for all openings in roads by the Contractor in accordance with City and State standards.

1.02 MINIMUM REQUIREMENTS OF THE TRAFFIC PLAN

A. Plan shall provide for access to all buildings including businesses and parking areas at all times.

B. Plan will allow for the maintenance of traffic in one lane, in one direction at all times, as a minimum.

C. Plan shall illustrate traffic detours as approved by the Lowell Public Works and Lowell Regional Wastewater Utility, location, type and size of signage.

D. Plan shall include schedule for traffic control in relation to construction.

E. See Sheet T-1 for LRTA site access management plan

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1.03 TRAFFIC SIGNALS,SIGNS AND CONTROLS

A. Contractor shall provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas under all Contractors' control, or affected by all Contractor's operations.

B. Provide traffic control and directional signs, mounted on barricades or standard posts at the following locations:

1. Each change of direction of a roadway and each crossroads.

2. Detours.

3. Parking areas.

C. Existing permanent traffic control signing and devices, including guardrails, shall not be removed without the prior consent of the agency responsible for the road.

D. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic in accordance with the approved traffic plan and further direction of the Engineer. While traffic is detoured, the Contractor shall expedite construction operations and the Owner will strictly control periods when traffic is being detoured. An illuminated traffic arrow board is required at each end of the construction site, as a minimum.

E. The Contractor shall take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.

F. Contractor shall provide at each of the following streets a minimum of four (4) solar powered, traffic control directional signs and four (4) electronic message boards for work along Pawtucket Street.

G. The Temporary Barrier shall be installed as shown on the plans and should be type MassDOT Item 853.2 Temporary Barrier, in accordance with these provisions and/or as directed by the Engineer. Each run of temporary barrier units shall be fastened together to form a continuous chain. Temporary impact attenuators with delineation shall be installed at ends of barriers within 30 feet (10 m) of approaching traffic. The Contractor shall not leave a barrier leading-end unprotected. Delineators shall be installed in conformance with manufacturer's recommendations on the barriers at their termini; at 20-foot (6 m) intervals on tangent sections; and 10 foot (3 m) intervals on curved sections depending on radius as determined by the Engineer. Delineators mounted on top of barriers separating opposing traffic shall have two sided amber reflectors delineating the left edge. Side mounted delineators shall have amber delineating the left edge, white delineating the right edge and have red as the back color. If mounted on the sides they shall be 6 inches (150 mm) below the top and on the side of traffic. Delineators shall be mounted at angles that provide maximum reflectorization. Temporary Barriers shall be removed from existing locations and reset in accordance with above requirements, as directed by the Engineer.

H. Contractor shall encompass all work areas not backfilled at day's end including special structures and piping excavations with suitable barriers and steel street plates.

I. Contractor shall provide signs promoting access to businesses during construction, locations to be coordinated with local businesses and per Engineer's approval.

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1.04 CONSTRUCTION PARKING CONTROL

A. Contractor shall control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Public Works Department operations, or construction operations.

B. Contractor shall monitor parking of construction personnel's private vehicles, maintain free vehicular access to and through parking areas and prohibit parking on or adjacent to access roads or in non-designated areas.

1.05 HAUL ROUTES

A. Contractor shall consult with governing authorities to establish public thoroughfares that will be used as haul routes and site access.

END OF SECTION

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SECTION 01576

POLICING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The intent is to insure public safety by police direction of traffic. Police are not to serve as watchmen to protect the Contractor's equipment and materials, or to warn pedestrians of such hazards as open trenches.

B. Nothing contained herein shall be construed as relieving the Contractor of any of his/her responsibilities for protection of persons and property under the terms of the Contract.

C. The Owner will arrange, document and pay the costs of police required for traffic control.

D. The Contractor shall arrange and coordinate all police details, which includes requesting, scheduling and locating all police details as necessary to perform the work under this Contract. Coordinate police detail activity with the Owner and Engineer as required.

E. Police details will be paid for directly by the Owner.

F. Cancellation of any scheduled police detail due to inclement weather, or any other reason, shall be the responsibility of the Contractor, and shall be made no less than 1 hour prior to the scheduled start time. Contractor shall be responsible for payment of police details not used and not cancelled, or cancelled without proper 1 hour notice, with no reimbursement by the Owner.

END OF SECTION

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SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

PART 1 GENERAL

1.01 REQUIREMENTS

A. Furnish, install and maintain project identification signs.

B. Remove signs on completion of construction.

C. Allow no other signs to be displayed.

1.02 SUBMITTALS

A. Submit in accordance with the requirements of Section 01300.

1.03 PROJECT IDENTIFICATION SIGN

A. Two painted signs, of not less than 32 square feet (3 square meters) area, with painted graphic content to include:

1. Title of Project.

2. Name of Owner.

3. Names and titles of authorities:

4. Names and title of:

a. Engineer.

b. Professional Consultants.

5. Prime Contractor.

6. Major subcontractors.

B. Graphic design, style of lettering and colors: As approved by the Engineer and subject to the approval of the local Community Appearance Board (CAB) or its equivalent and applicable local regulations for signs.

C. Erect on each site at a lighted location of high public visibility, adjacent to main entrance to each site, as approved by the Engineer and the Owner.

1.04 INFORMATIONAL SIGNS

A. Painted signs with painted lettering, or standard products.

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1. Size of signs and lettering: as required by regulatory agencies, or as appropriate to usage.

2. Colors: as required by regulatory agencies, otherwise of uniform colors throughout Project.

B. Erect at appropriate location to provide required information.

1.05 QUALITY ASSURANCE

A. Sign Painter: Professional Experience in type of work required.

B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: May be new or used, wood or metal, in sound condition structurally adequate to work and suitable for specified finish.

B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.

1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.

C. Rough Hardware: Galvanized

D. Paint: Exterior quality, as specified in Division 9.

1. Use Bulletin colors for graphics.

2. Colors for structure, framing, sign surfaces and graphics: As selected by the Engineer.

PART 3 EXECUTION

3.01 PROJECT IDENTIFICATION SIGN

A. Paint exposed surfaces of supports, framing and surface material; one coat of primer and one coat of exterior paint.

B. Paint graphics in styles, sizes and colors selected.

3.02 MAINTENANCE

A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing or sign.

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3.03 REMOVAL

A. Remove signs, framing, supports and foundations at completion of project.

END OF SECTION

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SECTION 01601

CONTROL OF MATERIALS

PART 1 GENERAL

1.01 APPROVAL OF MATERIALS

A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished 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. Submit, in accordance with Section 01300, data relating to materials and equipment proposed to be furnished 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, submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the requirements specified herein. 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, 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.

1.02 HANDLING AND STORAGE OF MATERIALS

A. All materials and equipment to be incorporated in the work shall be handled and stored by the manufacturer, fabricator, supplier and Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting and any injury, theft or damage of any kind whatsoever to the material or equipment.

B. 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, reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. 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 a manner to reduce breakage, chipping, cracking and spalling to a minimum.

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C. All mechanical equipment subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer.

D. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work and no compensation shall be given for the damaged material or its removal.

E. All pipe and other materials delivered to the job shall be unloaded and placed in a manner which will not hamper the normal operation of the existing plant or interfere with the flow of necessary traffic.

END OF SECTION

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SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Control of Work in Section 01046.

2. Record Shop Drawings in Section 01300.

3. Warranties and bonds in Section 01740.

4. Closeout procedures.

5. Final cleaning.

1.02 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 Application for Final Payment identifying total adjusted Contract Sum, previous payments and sum remaining due, following submittal and approval of Record Documents and Records Drawings.

1.03 FINAL CLEANING

A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01701

WORK ON PRIVATE PROPERTY AND SITE ACCESS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall perform all required construction work on private property. The Contractor shall take special care to preserve and restore private property to its original condition after work is completed.

B. Contractor shall coordinate site access to private property with the Lowell Regional Wastewater Utility.

C. Contractor shall take pictures inside each private property before beginning work to document existing conditions.

1.02 EXTERIOR WORK ON PRIVATE PROPERTY

A. Contractor shall take all precautions necessary to minimize disturbance to retaining walls (stone, concrete block or other), shrubs, trees, mailboxes, lamp posts, etc. and other features of the property. No cutting of trees or removal of shrubs will be allowed on private property unless directed otherwise by Owner. The Contractor will be responsible for restoration of the property to a condition at least equal to that existing prior to construction.

B. The Contractor shall minimize damage to existing landscape and yard features by properly handling and removing these items. Existing landscaping and other yard features shall be re-installed whenever possible. Any damaged items or items deteriorated or for other reasons are unable to be re-installed shall be replaced with items equal to or better than existing. All items to be replaced and/or re-installed shall be approved by the Owner.

C. If trees or shrubs which are not to be removed are damaged during construction to such degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced at the Contractor's expense by items of kind and quality at least equal to that existing at the start of the work.

D. Fences, walks, stone walls and other private property which might be damaged by the Contractor's operations shall be removed, and replaced at the Contractor's expense to a condition at least equal to that existing at the start of the work.

E. Grass areas damaged by the Contractor's operations shall be loamed and hydroseeded as specified under applicable provisions of Section 02930 and shall be restored to a condition equal to or better than that existing prior to construction.

F. All paved areas shall be repaired as specified in Section 02576 and all concrete sidewalk, walkway, driveway apron and driveway areas shall be repaired as specified.

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1.03 INTERIOR WORK ON PRIVATE PROPERTY

A. Contractor shall take all precautions to minimize disturbance to walls, floors, piping, hangers, columns, girders, personal belongings, etc. and other features existing inside existing basements and structures where the work will be performed. No private property shall be demolished or destroyed unless required to complete the Work. The Contractor will be responsible for restoration of property to a condition at least equal to that existing prior to construction.

B. The Contractor shall minimize damage to existing basement features during execution of the work. Personal belongings in the way of the area of work shall be carefully moved aside to complete the work. If the Contractor is not comfortable moving existing personal belongings in the way of the Work, he shall coordinate with the Lowell Regional Wastewater Utility (LRWWU) to have the items moved by the property owner. Any damaged items shall be replaced with item of equal or better than existing. All items replaced shall meet the approval of the Owner.

C. Any walls damaged (scuffed, chipped, etc) as a result of Contractor's operations shall be repaired prior to completion of work.

D. Contractor shall protect existing private property and belongings along all paths of entrance and egress during the progress of work. Work areas and walkways used to enter and exit the building shall be cleaned and returned to the condition existing prior to construction.

1.04 SITE ACCESS

A. Access to work on private property shall be coordinated by the LRWWU. LRWWU will obtain permission to access property through separate agreement between the LRWWU and the property owner. The LRWWU will schedule an appointment with the property owner to execute the work. Contractor shall not access private property until authorized by the LRWWU.

B. Upon completion of the construction, all traces of access shall be removed and all yard features and landscaping which existed prior to the start of work shall be replaced or restored to their original condition.

1.05 RESTORING PRIVATE PROPERTY AND RIGHTS-OF-WAY

A. The Contractor shall be responsible for all damage to private property due to his operations and shall protect from injury all walls, fences, cultivated shrubbery and vegetables, fruit trees, pavement, underground facilities, such as water pipe, or other utilities which may be encountered along the pipe route. If removal and replacement are required, it shall be done in a workmanlike manner so that replacement is equivalent to that which existed prior to construction.

B. Existing trees, shrubs, plants, and bushes shall be fully protected as specified in Section 01046. The work shall also include removing and replacing trees, shrubs and bushes as required. It shall include the careful excavation of the root ball which shall be wrapped with burlap while out of the ground. The Contractor shall replant them after backfilling the trench, stake them in an upright position, and shall periodically water replanted trees, bushes and shrubs. The Contractor shall be fully responsible for ensuring that any and all trees, bushes and shrubs removed and replanted atake and return to a viable state. Any replanted item that fails to atake or that is so damaged as to be unsuitable for replanting shall be replaced by the Contractor, at no additional

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cost to the Owner, with a tree, bush or shrub equal to the one removed. New or replacement trees, brushes or shrubs will be installed in accordance with Section 02900.

C. The Owner will inspect all work for provisional acceptance upon written request of the Contractor as specified in Section 02900.

D. All plants shall be guaranteed by the Contractor as specified in Section 02900.

E. The Contractor shall be responsible for all damage to private property and belongings inside existing basements and structures. Contractor shall repair or replace damaged items to pre-construction conditions. Contractor shall clean all areas where work took place or used to conduct work and leave areas in the condition existing prior to construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01740

WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

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.

1.02 RELATED WORK

A. Refer to Conditions of 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.

1.03 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 date 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 15 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 Owner for approval prior to final execution.

D. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.

1.04 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.

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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. 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.

1.05 BOND REQUIREMENT

A. Related Damages and Losses: When correcting bonded 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 bonded work.

B. Reinstatement of Performance and Payment Bonds: When work covered by a bond has failed and been corrected by replacement or rebuilding, reinstate the bond by written endorsement. The reinstated bond shall be equal to the original bond with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a bond 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: Performance and payment bonds furnished 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 bond periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

E. Rejection of Bonds: The Owner reserves the right to reject bonds and to limit selections to products not in conflict with requirements of the Contract Documents.

F. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the bonding on the work that incorporates the products.

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1.06 MANUFACTURERS CERTIFICATIONS

A. Where required, the Contractor shall supply evidence, satisfactory to the Engineer, that the Contractor can obtain manufacturers' certifications as to the Contractor's installation of equipment.

1.07 DEFINITIONS

A. Standard Product Warranties are preprinted 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

Division 2 – Sitework

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SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and perform all site preparation, complete as shown on the Drawings and as specified herein.

B. Obtain all permits required for site preparation work prior to proceeding with the work, including clearing and tree removal.

C. The areas to be cleared, grubbed and stripped within public rights-of-way and utility easements shall be minimized to the extent possible for the scope of pipeline work and in consideration of the actual means and methods of construction used. No unnecessary site preparation within these areas shall be performed.

1.02 RELATED WORK

A. Environmental Protection Procedures is included in Section 01110.

B. Work on Private Property and Site Access is included in Section 01701.

C. Earthwork is included in Section 02221.

D. Landscaping is included in Section 02900.

E. Loaming and Seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, copies of all permits required prior to clearing, grubbing, and stripping work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING

A. Cut and remove all timber, trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground.

B. Preserve and protect trees and other vegetation designated on the Drawings or directed by the Engineer to remain as specified below.

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3.02 GRUBBING

A. Grub and remove all stumps, roots in excess of 1-1/2-in in diameter, matted roots, brush, timber, logs, concrete rubble and other debris encountered to a depth of 18-in below original grade or 18-in beneath the bottom of foundations, whichever is deeper.

B. Refill all grubbing holes and depressions excavated below the original ground surface with suitable materials and compact to a density conforming to the surrounding ground surface in accordance with Section 02221.

3.03 STRIPPING

A. Strip topsoil from all areas to be occupied by buildings, structures, and roadways and all areas to be excavated or filled.

B. Topsoil shall be free from brush, trash, large stones and other extraneous material. Avoid mixing topsoil with subsoil.

C. Stockpile and protect topsoil until it is used in landscaping, loaming and seeding operations. Dispose of surplus topsoil after all work is completed if directed by Owner and Engineer.

3.04 DISPOSAL

A. Cut tree trunks and limbs exceeding 4-in in diameter shall be cut into 4-ft lengths.

B. Dispose of material and debris from site preparation operations by hauling such materials and debris to an approved offsite disposal area. No rubbish or debris of any kind shall be buried on the site.

C. Burning of cleared and grubbed materials or other fires for any reason will not be permitted.

3.05 PROTECTION

A. Trees and other vegetation designated on the Drawings or directed by the Engineer to remain shall be protected from damage by all construction operations by erecting suitable barriers, guards and enclosures, or by other approved means. Conduct clearing operations in a manner to prevent falling trees from damaging trees and vegetation designated to remain and to the work being constructed and so as to provide for the safety of employees and others.

B. Maintain protection until all work in the vicinity of the work being protected has been completed.

C. Do not operate heavy equipment or stockpile materials within the branch spread of existing trees.

D. Immediately repair any damage to existing tree crowns, trunks, or root systems. Roots exposed and/or damaged during the work shall immediately be cut off cleanly inside the exposed or damaged area.

E. When work is completed, remove all dead and downed trees. Live trees shall be trimmed of all dead and diseased limbs and branches. All cuts shall be cleanly made at their juncture with the trunk or preceding branch without injury to the trunk or remaining branches.

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F. Restrict construction activities to those areas within the limits of construction designated on the Drawings, within public rights-of-way, and within easements provided by the Owner. Adjacent properties and improvements thereon, public or private, which become damaged by construction operations shall be promptly restored to their original condition, to the full satisfaction of the property owner.

END OF SECTION

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SECTION 02125

TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, material, tools and equipment necessary for the transportation and disposal of excess contaminated urban fill materials or other contaminated soils as may be encountered during the course of the work. Contaminated materials include, but are not limited to contaminated urban fill soil and potentially dewatering groundwater.

B. The Contractor shall be responsible for determining the appropriate disposal location based on stockpile sampling and analysis results and disposal facility testing results from this Section. Disposal facility selection by the Contractor will be subject to the Engineer's review. Urban fill that is known or suspected of being impacted and is to be stockpiled for disposal analysis shall not be blended with native material unless approved by the Engineer.

C. The Owner will be the generator and will sign all waste profiles, bills of lading and hazardous waste manifests. Owner information is as follows:

Owner's Name: Mr. Mark Young
Owner's Title: Executive Director
Owner's Address: First Street Boulevard, Route 110, Lowell, MA 01850
Owner's Telephone Number: 978-970-4248
Owner's Facsimile Number: 978-459-3826
Project Name: Decatur West Stormwater Management and Marginal Sewer Relief Pipe
Site Address: N/A
Generator's EPA Identification Number: MAP9789704248

D. For contaminated soil disposal, where more than one disposal option exists, the Contractor shall select the least costly disposal option approved by the Engineer.

E. The Engineer will provide a licensed site professional to review all soil and groundwater analytical results and to review and sign/seal any material shipping records or bills of lading as may be required for shipping to the disposal or recycling facilities.

F. Should other contaminants of a reportable nature be discovered during the progress of the work, the Engineer/LSP shall provide oral and written notice of a utility related abatement measure to the MassDEP and inform the Contractor.

1.02 SUBMITTALS

A. Submit, in accordance with Section 01300, all pertinent information relating to the transport and disposal of materials specified herein. The information submitted shall include the following:

1. Transporter Information:

a. Name and address of common carrier transporters to be used on project.

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b. Name and address of licensed hazardous waste transporters to be used on project. Provide current licenses and permits to operate in all states affected by transport. Provide current EPA transporter license.

2. Facility Information

a. General Information

i. Facility Name
ii. Facility Address
iii. Name of Contact Person
iv. Title of Contact Person
v. Telephone Number of Contact Person
vi. Permit Number

b. The facility shall provide written confirmation that they are permitted to accept and will accept material of the general quality and quantity described by these Specifications.

c. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of materials specified in this Contract.

d. Submit a complete list of the disposal facility's permitted allowable contaminant levels and physical characteristic requirements for contaminated material, and list any required regulatory approvals for individual waste streams.

B. Provide the Engineer with originals of all hazardous waste manifests, non-hazardous waste manifests and bills of lading, and material shipping records, no less than 7 days in advance of shipping OHM off site.

C. Submit to the Engineer, copies of all analytical data. Analytical data shall be kept confidential, and distributed to the Engineer only.

D. Submit to the Engineer, by fax, within 48 hours of receipt of wastes at accepting disposal, recycling and reuse facilities, copies of facility-signed hazardous waste manifests, non-hazardous waste manifests, bills of lading and material shipping records.

1.03 DEFINITIONS

A. In-State Landfill - This type of landfill shall be approved by the Commonwealth of Massachusetts to accept soil for reuse with concentration levels below the Department of Environmental Protection Policy # COMM-97-001 criteria listed below:

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Facility Maximum Contaminant Levels		
Contaminant	Lined Landfill Reuse Levels (mg/kg)	Unlined Landfill Reuse Levels (mg/kg)
Total Arsenic	40	40
Total Cadmium	80	30
Total Chromium	1,000	1,000
Total Lead	2,000	1,000
Total Mercury	10	10
Total Petroleum Hydrocarbons	5,000	2,500
Total PCBs	<2	<2
Total SVOCs	100	100
Total VOCs	10	4
Listed or Characteristic Hazardous Waste (TCLP)	None	None

B. In-State Recycling Facility - This type of facility shall be approved by the Commonwealth of Massachusetts to accept soil for reuse with concentration levels below the Department of Environmental Protection Policy # WSC-400-001 listed below:

Facility Maximum Contaminant Levels			
Contaminant	Hot Mix Asphalt Plant mg/kg	Thermal Processing Plant mg/kg	Cold Mix Emulsion Plant mg/kg
Total Arsenic	30	30	30
Total Cadmium	30	11	30
Total Chromium	500	500	500
Total Lead	1,000	1,000	1,000
Total Mercury	10	3	10
Total VOCs	1800	1800	1800
Total Petroleum Hydrocarbons	60,000	60,000	60,000
Total PCBs	<2	<2	<2
Total Halogenated VOCs	5	5	5
Listed or Characteristic Hazardous Waste (TCLP)	None	None	None

C. Out-of-State Landfill - This type of landfill shall be state approved or permitted to accept soil that is not classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261or PCB waste as defined in 40 CFR 761. This type of landfill shall accept soil for disposal and reuse purposes.

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D. Out-of-State Recycling Facility - This type of facility shall be state approved or permitted to accept soil that is not classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261or PCB waste as defined in 40 CFR 761.

E. RCRA Landfill – This type of landfill shall be state and federally approved to accept soil that is classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR261.

F. RCRA TSD Facility – This type of facility shall be state and federally approved to accept soil that is classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR 261.

G. TCLP Material – Soil, through TCLP analysis, that exceeds the regulatory limit established for any one or more RCRA metals set forth in Table 1 of 40 CFR 261.24.

H. Listed Waste Material – Soil, through VOC analysis, that indicates the presence of any of F-code wastes set forth in 40 CFR 261.31 or U-code wastes set forth in 40 CFR 261.33.

I. Disposal Facility – In-state Landfill, In-State Recycling Facility, Out-of-State Landfill, Out-of-State Recycling Facility, RCRA Landfill or RCRA TSD Facility.

J. TSD – Treatment, storage and disposal.

K. Underlying Hazardous Constituent (UHC) – As defined in 40 CFR 268.2, "Any constituent listed in 40 CFR 268.48, Table UTS – Universal Treatment Standards, except fluoride, selenium, sulfides, vanadium and zinc which can be reasonably expected to be present at the point of generations of the hazardous waste, at a concentration above the constituent-specific UTS treatment standard." For this project, metals and PAHs are the UHCs, "reasonably expected" to be present above applicable UTS.

L. Universal Treatment Standard (UTS) – Numerical standards set forth in 40 CFR 268.48, Table UTS – Universal Treatment Standards. Non-wastewater and wastewater treatment standard levels that are used to regulate most prohibited hazardous wastes. Applicable UTS for soils are defined in 40 CFR 268.49(c).

1.04 REGULATORY REQUIREMENTS

A. Massachusetts Department of Environmental Protection

1. Massachusetts Contingency Plan, 310 CMR 40.0000

2. Massachusetts Hazardous Waste Regulations, 310 CMR 30.000

3. Interim Remediation Waste Management Policy for Contaminated Soils, Policy # WSC-94-001.

4. Reuse and Disposal of Contaminated Soils at Massachusetts Landfills, Policy # COMM-97-001.

B. United States Department of Environmental Protection (EPA)

1. Federal Hazardous Waste Regulations, 40 CFR 261-268.

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C. Disposal of TCLP material at RCRA Landfills is subject to all applicable provisions of the Phase IV Land Disposal Restrictions (LDR) of 40 CFR 268. The Work of this Section shall include all necessary supplemental treatment required to reduce concentrations of all Underlying Hazardous Constituents (UHCs) to levels below applicable Universal Treatment Standards (UTS) prior to landfill disposal.

PART 2 PRODUCTS

2.01 GENERAL

A. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this Work.

PART 3 EXECUTION

3.01 GENERAL

A. The Owner will be the generator and will sign waste profiles, hazardous waste manifests, non-hazardous waste manifests, bills of lading and material shipping records.

B. The Contractor shall identify appropriate disposal facilities and make all necessary arrangements for disposal of materials.

C. It is anticipated that upon stockpiling and sampling and analysis that the excess urban fill soils will be suitable for disposal at an in-state unlined or lined landfill as defined above, 1.03 Definitions. Should testing determine that a more stringent or differing approach is required, then a unit price shall be established for transportation and disposal and shall be the subject of pricing/negotiation per the contract. As noted, the above Definitions shall govern.

D. Stockpiled soil shall be covered as specified in the Massachusetts Contingency Plan while it is awaiting shipment. No urban fill soil may leave the project site without approval of the Owner and Engineer.

3.02 DISPOSAL FACILITY TESTING

A. The Contractor shall be responsible for characterizing the soil for the purpose of obtaining approvals for final disposal of contaminated, surplus and unsuitable soil. The Contractor shall collect soil samples to perform testing required by the disposal facility.

1. Submit a copy of all analytical results to the Engineer within 2 days of receipt of the laboratory report. Analytical data shall be kept confidential, and distributed to the Owner and Engineer only. Engineer's review of data will be 2 days.

B. Sampling of contaminated soil shall be done at sufficient and adequately distributed locations in the stockpiles so that the concentrations of the chemical constituents are adequately characterized as required by the disposal facility or at one sample per 500 cubic yards, the more stringent requirement governing.

C. Coordinate schedule so that Engineer may observe sample collection.

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3.03 WASTE PROFILES AND SHIPPING DOCUMENTS

A. Prepare and submit to the Engineer for review all waste profiles, LSP opinion letters, and coordinate with disposal facilities.

B. Prepare all manifests and if necessary, land ban certifications. Submit these to the Engineer for review at least 7 days before transport. Engineer will be responsible for obtaining Owner's signature prior to said use.

C. Prepare bill of lading forms and material shipping records. Submit these to the Engineer for review at least 7 days before transport. Engineer will sign as LSP on bill of lading and LSP opinion letter and will be responsible for obtaining Owner's signature prior to said use.

D. Submit to Owner and the Engineer, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected receiving facility.

1. Facility signed manifests and original bills of lading (forms BWSC-12A, -12B and -12C) and material shipping records.

2. Certified tare and gross weights for each load.

3.04 TRANSPORT AND DISPOSAL

A. The Contractor shall not be permitted to transport materials off-site until all disposal facility documentation has been received, reviewed, and accepted by Owner and the Engineer.

B. Transport and dispose in accordance with all United States Department of Transportation (DOT), USEPA, MDEP regulations and other regulations of all affected states.

C. The Contractor shall be responsible for ensuring that free-liquid does not develop during transport. "Wet soils" shall not be loaded for transport. The Contractor shall be responsible to properly dispose of any free liquids that may result during transportation.

D. For TCLP Material, stabilize and reduce UHCs to below applicable UTS to comply with Phase IV of the Land Disposal Restrictions (LDR).

E. Dispose of hazardous waste within 90 days of generation.

END OF SECTION

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SECTION 02140

DEWATERING AND DRAINAGE

PART 1 GENERAL

1.00 STATUTORY REQUIREMENTS

A. Obtain and pay for all permits required for temporary dewatering and drainage systems.

B. Original permits shall be prominently displayed on the site prior to construction dewatering and drainage systems.

1.01 SCOPE OF WORK

A. Design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system as required and lower and control water levels to at least 2.0 feet below the subgrade level of excavations to permit construction to occur "in the dry" and to permit stable subgrades.

B. Furnish, maintain and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.

C. Collect and properly dispose of all discharge water from the dewatering and drainage systems in accordance with the provisions of Section 01170 and in accordance with local, state and federal requirements and permits.

D. Furnish the services of a licensed professional engineer, registered in the Commonwealth of Massachusetts to prepare dewatering and drainage system designs and submittals described herein.

E. Repair damage to properties, buildings or structures, sewers, utilities, and pavement caused by dewatering and drainage system operations.

F. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

G. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation required to monitor the performance of the dewatering and drainage system as required herein.

1.02 RELATED WORK

A. Environmental Protection Procedures are included in Section 01110.

B. Site Preparation is included in Section 02100.

C. Rock and Boulder Excavation is included in Section 02213.

D. Earthwork is included in Section 02221.

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E. Support of Excavation is included in Section 02311.

F. Pipe Jacking is included in Section 02340.

G. Geotechnical Instrumentation is included in Section 02495.

1.03 DESIGN REQUIREMENTS

A. The Contractor is responsible for the proper design and execution of methods for controlling surface water and groundwater.

B. The primary purpose of groundwater control is to preserve the natural undisturbed condition of subgrade soils in the areas of the proposed pipeline and associated structures. Prior to excavation, the Contractor shall lower the groundwater to at least 2 feet below the bottom of any part of the excavation. Additional groundwater lowering may be necessary beyond the 2-ft requirement, depending on construction methods and equipment used and on the prevailing groundwater and soil conditions. The Contractor is responsible for lowering the groundwater level to whatever level is dictated by the selected construction methods and by site conditions, at no additional cost to the Owner.

C. Design of deep wells, well points and sumps and any other groundwater control system components to prevent loss of fines from surrounding soils. Sand filters shall be used with all dewatering installations unless screens are properly sized to prevent passage of fines from surrounding soils.

D. The Contractor will responsible for all damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from dewatering or surface water control operations.

E. Design review and field monitoring activities by the Owner or of the Engineer shall not relieve the Contractor of his/her responsibilities for the work.

1.04 SUBMITTALS

A. Dewatering and drainage system designs shall be prepared by a licensed professional engineer, registered in the Commonwealth of Massachusetts, retained by the Contractor. Submit an original and three copies of the licensed professional engineer's certification, on the PE form specified in Section 01300, stating that the dewatering and drainage system designs have been prepared by the professional engineer and that the professional engineer will be responsible for their execution. The Contractor shall also submit qualifications as required herein.

B. The Contractor shall submit a dewatering and drainage system design plan. The plan shall include a description of the proposed dewatering system and include the proposed installation methods to be used for dewatering and drainage system elements and for observation wells. The plan shall include equipment, drilling methods, holes sizes, filter sand placement techniques, sealing materials, development techniques, the number and location of dewatering points and observations wells, etc. Include the dewatering system design calculations in the plan.

C. The plan shall identify the anticipated area influenced by the dewatering system and address impacts to adjacent existing and proposed structures.

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D. Coordinate dewatering and drainage submittals with the excavation and excavation support submittals. The submittal shall show the areas and depths of excavation to be dewatered.

E. Do not proceed with any excavation until the dewatering and drainage submittal has been reviewed by the Engineer.

1.05 QUALITY ASSURANCE

A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.

B. The Contractor shall have at least 5 years of experience with work compatible to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of Work.

C. The Contractor's design engineer shall be registered in the Commonwealth of Massachusetts and have a minimum of 5 years of professional experience in the design and construction of dewatering and drainage systems and shall have completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that require for the work.

1.06 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as an excavation subgrade where the groundwater level has been lowered to at least 2 feet below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe for observation wells, if required, shall consist of minimum 1-in I.D., Schedule 40 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.020-in.

B. Piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavations shall be suitable for the intended purpose.

C. Standby pumping systems and a source of standby power shall be maintained at all sites.

PART 3 EXECUTION

3.01 GENERAL

A. Methods of groundwater control may include but are not limited to perimeter trenches and sump pumping, perimeter groundwater cutoff, well points, ejectors, deep wells and combination thereof.

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B. Control surface water and groundwater such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed, and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.

C. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system will be required for pre-drainage of the soils prior to excavation to final grade and for maintenance of the lowered, groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with soil/water conditions at a particular location.

D. All work included in this Section shall be done in a manner which will protect adjacent structures and utilities and shall not cause loss of ground or disturbance to the pipe bearing soils or to soils which support overlying or adjacent structures.

E. If requested by the Engineer, install, monitor and report data from observation wells. Evaluate the collected data relative to groundwater control system performance and modify systems as necessary to dewater the site in accordance with the Contract requirements.

F. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with the installation and monitoring of geotechnical instrumentation including observation wells. Excavations for sumps or drainage ditches shall not be made within or below 1H:1V slopes extending downward and out from the edges of existing or proposed foundation elements or from the downward vertical footprint of the pipe.

3.02 SURFACE WATER CONTROL

A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations and to allow construction to proceed without delay.

3.03 EXCAVATION DEWATERING

A. All times during construction, the Contractor shall furnish and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be maintained in-the-dry, so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations. Groundwater levels shall be kept at least 2 feet below the lowest excavation level.

B. Pipe, masonry and concrete shall not be laid in water or submerged within 24 hours after being installed. Water shall not flow over new masonry or concrete within 4 days after placement.

C. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill.

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D. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed condition of the subgrade soils at proposed bottom of excavation. If the subgrade of the trench bottom or excavation becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by the Engineer and refill with structural fill, screened gravel or other material as approved by the Engineer at the Contractor's expense.

E. Evaluate the impact of the anticipated subsurface soil/water conditions on the proposed method of excavation and removal of water. It is expected that the initial dewatering plan may have to be modified to suit the variable soil/water conditions to be encountered during construction. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

G. If the method of dewatering does not properly dewater the trench as specified, install groundwater observation wells as directed by the Engineer and do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 2 feet below the bottom of the final excavation within the trench limits.

H. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.

I. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sump and pumped from the excavation to maintain a bottom free from standing water.

J. Drainage shall be disposed of in an approved area as specified in Section 01170. Existing or new sanitary sewers shall not be used to dispose of drainage.

3.04 WELL POINT SYSTEMS

A. Where necessary, install a vacuum wellpoint system around the excavation to dewater the excavation. Each wellpoint and riser pipe shall be surrounded by a sand or gravel filter. Sand shall be of such a gradation that, after initial development of the wellpoints, the quantity and size of soil particles discharged shall be negligible. Wellpoint systems shall be capable of operating continuously under the highest possible vacuum.

B. Installation of well point systems shall be in accordance with the approved submittal in the presence of the Engineer.

3.05 DEEP WELLS

A. Where necessary, install a deep well system around the excavation to dewater or depressurize the excavation. Each well shall be surrounded by a sand or gravel filter with adequate gradation such that after development, the quantity and size of soil particles discharged are negligible. Sufficient number of wells shall be installed to lower or depressurize the groundwater level to allow excavation to proceed in-the-dry.

B. Installation of deep well shall be in accordance with the approved submittal in the presence of the Engineer.

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3.06 OBSERVATION WELLS

A. Install observation wells as required under this Section or in accordance with the approved submittal to monitor groundwater levels beneath and around the excavated area until adjacent structures and pipelines are completed and backfilled.

B. Observation Well Locations and Depths:

1. Observation wells required shall be installed to a depth of at least 10-ft below the deepest level of excavation, unless otherwise approved by the Engineer, and to whatever depth is necessary to indicate that the groundwater control system designed by the Contractor's Engineer is performing as intended. Additional observation wells may be required by the Engineer if deemed necessary to monitor the performance of the Contractor's groundwater control system.

2. Locations and depths of observation wells are subject to approval by the Engineer.

C. Protect the observation wells at ground surface by providing a lockable box or outer protective casing with lockable top and padlock. Design the surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.

1. Provide two copies of keys for each padlock to the Engineer for access to each well.

2. Observation wells shall be developed so as to provide a reliable indication of groundwater levels. Wells shall be re-developed if well clogging is observed, in the event of apparent erroneous readings, or as directed by the Engineer.

3. Submittal observation well installation logs, top of casing elevation, and well locations to the Engineer within 24 hours of completion of well installation.

D. Observation Well Maintenance

1. The Contractor shall maintain each observation well until adjacent structures and pipelines are completed and backfilled. Clean out or replace any observation well which ceases to be operable before adjacent work is completed.

2. It is the Contractor's obligation to maintain observation wells and repair or replace them at no additional cost to the Owner, whether or not the observation wells are damaged by the Contractor's operations or by third parties.

E. Monitoring and Reporting of Observation Well Data

1. The Contractor shall begin daily monitoring of groundwater levels in work areas prior to initial operation of drainage and dewatering system. Daily monitoring in areas where groundwater control is in operation shall continue until the time that adjacent structures and pipelines are completed and backfilled and until the time that groundwater control systems are turned off.

2. The Contractor is responsible for processing and reporting observation well data to the Engineer on a daily basis. Data is to be provided to the Engineer on a form, which shall

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include the following information: observation well number, depth to groundwater, total depth of well, top of casing elevation, groundwater level elevation and date and time of reading.

3.07 REMOVAL OF SYSTEMS

A. At the completion of the excavation and backfilling work, and when approved by the Engineer, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the Contractor. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.

B. Leave in place any casings for deep wells, wellpoints or observation wells located within the plan limits of structures or pipelines or within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.

C. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 3 feet below finished ground level or 1 foot below foundation level so as not to interfere with finished structures or pipelines.

D. When directed by the Engineer, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

END OF SECTION

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SECTION 02213

ROCK AND BOULDER EXCAVATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform excavation and disposal of rock and boulders such that damage is prevented to adjacent utilities, pipes, structures, property and the work and such that resulting ground vibrations are consistently maintained below the maximum levels specified in Section 02495.

B. Blasting will not be permitted on this project.

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Granular Fill Materials is included in Section 02230.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, the proposed methods of excavation for the various portions of the work. Contractor remains responsible for means, methods, and techniques, as well as all safety considerations.

B. Submit, in accordance with Section 01300, at least two weeks prior to commencing rock and boulder excavation the following:

1. A description of the means and methods of rock and boulder excavation techniques including size and energy of any impact equipment and chemical properties of any chemical agents to be used for chemical splitting.

2. Name and qualifications of the person(s) responsible for monitoring and reporting rock excavation vibrations.

C. Review by the Engineer of material submitted by the Contractor shall not relieve the Contractor of responsibility for the accuracy, adequacy and safety of the blasting, exercising proper supervision and field judgment and producing the results within the blasting limits required by this Section.

1.04 DEFINITIONS

A. Rock: Any large mass of stone, bedrock, or ledgerock.

B. Boulder: Rock fragments exceeding 1 cu yd in volume.

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C. Rock Excavation: The removal of solid rock or rock fragments greater than 1 cu yd in volume which, in the opinion of the Engineer for its removal drilling, wedging, sledging, cutting, barring, jack hammering, hoe ramming or expansive chemical splitting and which cannot be removed by a tracked excavator with a bucket curling force of at least 18,300 pounds.

D. Boulder Excavation: The removal of boulders exceeding 1 cu yd in volume which can be excavated without resorting to rock excavation methods.

E. Rock fragments less than 1 cubic yard which can be removed without resorting to rock excavation shall be considered as "Soil Excavation".

1.05 QUALITY ASSURANCE

A. Qualifications

1. Vibration monitoring shall be conducted by persons 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.

B. Codes, Permits and Regulations

1. The Contractor shall comply with applicable laws, rules, ordinances, and regulations of the Federal Government, the Commonwealth of Massachusetts, City of Lowell, and the MBTA (or their representatives) regarding rock excavation. No blasting shall be allowed for this project.

2. The Contractor shall obtain and pay for permits and licenses required to complete the work of this Section.

3. In case of conflict between regulations or between regulations and these Specifications, the Contractor shall comply with the more stringent applicable codes, regulations or these Specifications.

C. Vibration Limit Criteria - The Contractor shall limit rock excavation operations to prevent damage to any adjacent building, structure, utilities, pipes or other features near the site. The Contractor is solely responsible to determine the maximum vibration tolerable at each facility. However, in no case shall the following be exceeded.

1. Peak Particle Velocity (PPV) limits at ground surface at existing residential or other structures:

Frequency (Hz)	Maximum Peak Particle Velocity (in. per. sec.)
Over 40	2.0
30 to 40	1.5
20 to 30	1.0
Less than 20	0.5

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D. Vibration Monitoring

1. The Contractor shall monitor peak particle velocities using a minimum of two seismographs operated by personnel trained in their use during all rock excavation activities. Locations shall be mutually agreed upon by the Engineer and Contractor.

2. The Engineer may direct that additional vibration monitoring be performed if conditions warrant such action.

E. Vibration Monitoring Instrumentation

1. Provide two (minimum) seismographs for full time use on the project during blasting which have been calibrated within the previous six months to a standard, which is traceable to the National Bureau of Standards. Required characteristics of seismographs are listed below:

a. Measure the three 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 air blast overpressure immediately after each blast.

c. Furnish a permanent record of a velocity/time waveform, on a strip chart or from magnetic tape.

d. Have a flat velocity frequency response with a minimum broad band of 6 Hz to 150 Hz with a tolerance equal to or better than plus or minus 10 percent.

e. Have a low frequency omnidirectional transducer for measuring air blast overpressure with a flat frequency response within the limits of 2 Hz to 250 Hz with a tolerance equal to or better than plus or minus 10 percent.

F. The Contractor shall be completely responsible for all damages resulting from the rock excavation operations and shall, as a minimum, take whatever measures are necessary to maintain peak particle velocities within the specified limits. Modifications to blasting and excavation methods required to meet these requirements shall be undertaken at no additional cost to the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. When rock is encountered, it shall be uncovered, but not excavated, until measurements are made by the Engineer.

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3.02 ROCK EXCAVATION

A. Rock excavation may be performed by drilling, wedging, sledging, cutting, barring, jack hammering, hoe ramming, expansive chemical splitting, or other similar processes in a manner that does not cause damage to the existing utilities, structures or new construction.

B. Blasting is not allowed.

C. All rock excavation operations shall comply with the project, state and local noise and dust regulations.

D. All rock excavation at the LRTA site shall comply with the MBTA regulations.

E. If rock below grade is shattered by rock excavation methods, and if, in the opinion of the Engineer, the shattered rock is unfit for subgrade, the rock shall be removed and the excavation refilled with thoroughly compacted screened gravel or structural fill at no additional cost.

3.07 BOULDER EXCAVATION

A. Boulders and rock fragments up to 1 cu yd in volume may be reduced in size by rock excavation methods to simplify its removal.

3.08 DISPOSAL OF ROCK AND BOULDERS

A. Fragmented rock with dimensions not exceeding 6 inches in any direction may be mixed with common fill and used as common fill in accordance with Section 02221. Rock and boulders may be crushed and screened for reuse in the Work, provided that the resultant material meets the requirements for screened gravel, crushed stone, or structural fill as specified in Section 02230. Rock and boulder material disposed of by wasting shall be replaced by available surplus suitable soils. Common fill to supply any deficiency of backfill shall be provided at no additional cost.

B. Unused rock and boulders shall be removed and disposed of off-site.

END OF SECTION

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SECTION 02221

EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all excavation and its support for pipelines, structures, headwall and appurtenances to complete the work as shown on the Drawings and as specified herein, including but not necessarily be limited to; excavation, drainage, filling, backfilling, grading, disposal of surplus material and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures and appurtenances.

C. The bottom of the excavation shall be firm, dry and in all respects, acceptable. Remove from the excavation all materials which the Engineer may deem unsuitable for backfilling. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related to the rate of pipe laying.

D. All excavation, trenching and related sheeting, bracing, etc, shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et. seq.). Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Furnish all labor, materials, equipment, supervision and incidentals necessary to perform all monitoring required to complete the Work shown on the Drawings and specified herein. The Work shall include, but not necessarily limited to: installation and survey of monitoring points on structures and utilities and reporting movements in accordance with the Drawings and Specifications.

F. Furnish all labor, materials, equipment, supervision and incidentals necessary to perform test borings to complete Work shown on Drawings and specified here. The Work shall include, but not necessarily limited to: test boring drilling, soil sampling, and logging. Test boring logs shall be prepared.

G. No extra work shall be initiated without notification of the Owner in writing, and the written approval of the Owner in response.

H. Wherever the requirement for compaction is referred to herein it shall mean as determined by ASTM D1557.

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I. Test boring logs are attached in Appendix A for the Marginal Sewer Relief pipe. Geotechnical record information from MassDOT highway and bridge projects in the vicinity of the LRTA Drainage Improvements site are attached in Appendix C.

J. Contractor shall perform two test borings for the LRTA Drainage Improvements portion of the work that will be coordinated with the Engineer.

K. For Part B work, Contractor shall stockpile excess excavated materials that are unsuitable for backfill material at the LRTA Drainage Improvements site. The stockpipe must be properly stabilized and seeded. The erosion control measures that are put in place around the stockpile shall be left in place at the end of the project.

1.02 RELATED WORK

A. Dust control is included in Section 01562.

B. Dewatering and drainage is included in Section 02140.

C. Rock and boulder excavation is included in Section 02213.

D. Granular fill materials is included in Section 02230.

E. Erosion and sedimentation control is included in Section 02270.

F. Support of excavation is included in Section 02311.

G. Pipe jacking is included in Section 02340.

H. Geotechnical instrumentation is included in Section 02495.

I. Pavement repair and resurfacing is included in Section 02576.

J. Loaming and seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, the following and as elsewhere specified in this Section:

1. The proposed methods of construction, including excavation, excavation support systems designs, backfilling and filling and compaction for the various portions of the Work.

2. A plan of settlement monitoring points established on existing structures and utilities shall be prepared by a Professional Land Surveyor (PLS) or Professional Engineer (PE) registered in the Commonwealth of Massachusetts, experienced and skilled in construction survey required under this Contract, and acceptable to the Engineer and Owner. Submit a copy of the registered professional land surveyor's certification form to show compliance with this requirement. The Contractor's PLS shall survey the elevation of each settlement monitoring point as described herein. Within 24 hours of each survey, the PLS shall submit to the

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Engineer the latest survey elevations at each monitoring point along with all previous survey elevations.

3. Compaction test documentation of backfill materials under structures, pipelines and pavements shall be provided to the Engineer.

4. Submit to the Engineer complete product data for materials specified in this Section.

5. Submit a plan of the test boring as drilled locations and test boring logs upon completion.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 – Standard Specification for Concrete Aggregates

2. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

3. ASTM D422- Test Method for Particle Size Analysis of Soils

4. ASTM D2922- Density of Soil in Place by Nuclear Methods (Shallow Depth)

5. ASTM D3017 – Standard Test Method for Water Content of Soil in Place by Nuclear Methods (Shallow Depth)

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

1.05 PROTECTION

A. All existing facilities which include but is not limited to structures, utilities, pavements, sidewalks, curbing, driveway aprons, fencing, landscaping and other improvements in the vicinity of the Contractor's operations shall be adequately protected. If necessary, curbing, driveway aprons and fencing shall be removed and restored or replaced after backfilling. All existing facilities damaged by the construction shall be replaced with material fully equal to that existing prior to construction to the satisfaction of the Owner.

B. Furnish, install monitor and maintain excavation support as required and as specified in Section 02311.

C. Furnish, install, monitor and maintain monitoring as required and as specified in Section 02495.

D. Furnish, install, monitor and maintain dewatering and drainage systems as required and as specified in Section 02140.

1.06 QUALITY ASSURANCE

A. Regulations: Perform all work in accordance with current application regulations and codes of all Federal, State and local agencies.

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B. The Contractor shall have at least five years experience with comparable work to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in the is type of work.

C. The Contractor's surveyor shall be a Professional Land Surveyor or Professional Engineer, registered in the Commonwealth of Massachusetts and shall have at least five years experience in construction survey of the type required under this Contract and acceptable to the Engineer and Owner.

D. Test borings shall be advance by a test boring contractor experienced in the work. Test borings shall be logged by an experienced geotechnical engineer or geologist.

1.07 SOIL TESTING

A. As soon as the subgrade is exposed, coordinate with the Engineer to verify the suitability of the existing subgrade soil and to perform in-place soil density tests as required to verify that the bearing capacity of the subgrade is sufficient.

B. Prior to the general placement of the backfill and fill, and during such placement, the Engineer may select areas within the limits of the fill for testing the degree of compaction obtained. Cooperate fully in obtaining the information desired.

C. Payment for testing will be made by the Owner. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer, will be borne by the Contractor.

1.08 CONSTRUCTION CONTROL

A. Contractor is responsible for all construction layout and reference staking necessary for the proper control and satisfactory completion of all structures, cutting, filling, grading, drainage and utilities installation, fencing, curbing, and all other appurtenances required for the completion of the construction work and acceptance of the Contract as specified and as shown on the Drawings.

B. All construction layout, staking and surveying shall be performed by a Professional Land Surveyor or Professional Engineer registered by the Commonwealth of Massachusetts, experienced and skilled in construction layout, staking and surveying of the type required under this Contract, and acceptable to the Engineer and Owner.

C. The Engineer will furnish the Contractor with control points, bench marks and other data as may be necessary for the construction staking, layout and survey.

D. The Contractor shall be responsible for the placement and preservation of adequate ties to all control points necessary for the accurate re-establishment of all base lines or center lines shown on the Drawings.

E. The Engineer may check the control of the work as established by the Contractor, at any time as the work progresses. The Contractor will be informed of the results of these checks, by but in so doing, the Engineer in no way shall relieve the Contractor of his responsibility for the accuracy of the layout work.

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PART 2 PRODUCTS

2.01 MATERIALS

A. Filter fabric shall be non-woven geotextile Mirafi 1100N or approved equivalent.

B. Granular materials designated for use in this Section are specified in Section 02230.

PART 3 EXECUTION

3.01 PREPARATION

A. Test Borings

1. Prior to start of construction at the LRTA site, the Contractor shall perform 2 test borings within 10 feet of the new pipeline at the LRTA site. Each of the test boring shall extend to at least El. 75 or 10 feet into bedrock, whichever occur first. Continuous split spoon sampling shall be conducted at each test boring in accordance with ASTM D1586 though the entire length of the boring in soil. Test boring logs shall be submitted that include, at the minimum, equipment used, drilling method, size of borehole, sample intervals, written sample descriptions, soil classification, blow counts, SPT N-values and groundwater level.

2. Test boring logs shall be submitted to the Engineer within 48 hr of completion of drilling.

3. Any modification to the design at the LRTA site based on the result of the test borings will be provided by the Engineer.

B. Test Pits

4. The Contractor may be required to excavate test pits for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.

5. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified in Paragraph 3.08 of this Section.

B. Dewatering and Drainage Systems

1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work as specified in Section 02140.

C. Settlement Monitoring

1. Settlement monitoring shall be in-place and initialized prior to the beginning of excavation work in accordance with Section 02495.

3.02 EXCAVATION SUPPORT

A. Excavation support shall be made in accordance with Section 02311.

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3.03 GENERAL EXCAVATION PROCEDURES

A. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall be suitably wide for construction of the structures or pipelines, including excavation supports, dewatering and drainage systems and working clearances.

B. Excavation shall be performed in-the-dry and shall be accomplished by methods which preserve the undisturbed state of subgrade soils.

C. Excavation equipment shall be satisfactory for carrying out the work in accordance with the requirements specified.

D. In no case shall the earth be plowed, scraped or excavated by any means so near to the finished subgrade that would disturb the finished subgrade. Hand excavation of the final 3 to 6-in may be required to obtain a satisfactory, undisturbed subgrade.

E. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by structural fill, crushed stone, or screened gravel fill as required by the Engineer at the Contractor's expense.

3.04 TRENCH EXCAVATION

A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders as defined in Section 02213. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating. Contractor shall protect and support existing sidewalks and curb to remain in place.

B. Strip and stockpile topsoil from grassed areas crossed by trenches. At the Contractor's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.

C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.

D. Trenches shall be excavated to the depth indicated on the Drawings and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer. Trench width shall be practical minimum.

E. The length of open trench shall be related closely to the rate of pipe placement.

F. Subgrade Preparation - Pipelines

1. The bottom of all trenches that terminate in granular soils at the subgrade level shall be proofrolled with a minimum of 2 passes of a hand operated vibratory compactor approved by the Engineer. If, in the opinion of the Engineer, the subgrade material, at or below the normal grade of the excavation as indicated on the Drawings is unsuitable for the support of

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the pipe, it shall be removed to such depth and width as he/she may direct and be replaced with suitable material as directed by the Engineer.

2. If organic soils, soft or loose soils, or existing miscellaneous fill are encountered at or below the subgrade elevation, the unsuitable soils shall be removed as indicated on the Drawings or up to a maximum of 4 feet below the pipeline invert as directed by the Engineer and be replaced with compacted structural fill, screened gravel wrapped in filter fabric or other approved material by the Engineer.

3. Clay, silt and fine sands are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last 1 foot of depth.

4. Rock shall be removed to a minimum 12-in clearance around the bottom and sides of all pipes being laid. Rock and boulder excavation shall be made in accordance with Section 02213.

G. Where pipe is to be laid in crushed stone bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

3.05 STRUCTURE AND HEADWALL EXCAVATION

A. Excavations for structures and headwall shall be suitably wide for construction of the structures and headwall, including excavation supports, dewatering and drainage systems and working clearances.

B. Subgrade Preparation and Protection

1. Care should be taken to avoid excess traffic on the excavated foundation subgrades prior to placement of structural fill or screened gravel. The exposed soil subgrade should be protected against precipitation and the subgrade should not be allowed to freeze.

2. Where the subgrade consists of granular soils, proofroll the exposed subgrade with a minimum of 4 completed coverages of the full area using a hand operated vibratory compaction equipment to the satisfaction of the Engineer.

3. In areas where the subgrade consists of existing fill, soft or loose materials, or organic soils, the unsuitable soils shall be removed down to naturally deposited, inorganic, stable soils or as shown on the Drawings or as directed by the Engineer and be replaced with compacted structural fill, compacted screened gravel or other suitable material as directed by the Engineer.

4. Where the subgrade consists of silts or clays, remove all disturbed soils with a smooth edged bucket or by hand down to a firm and stable soils and immediately place a filter fabric, then place and compact the bedding material.

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5. Rock shall be removed to a minimum of 12-in clearance around the bottom and sides of all structures. Rock and Boulder excavations shall be made in accordance with Section 02213.

3.06 DISPOSAL OF MATERIALS

A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

B. No excavated material shall be removed from the site of the work or disposed of, except as directed by the Engineer. When removal of surplus materials has been approved by the Engineer, dispose of such surplus material in approved designated areas. Surplus fill (or contaminated soils) at the Marginal Relief Sewer site shall become the property of the Contractor and shall be removed and properly disposed off site. Surplus fill and unsuitable material from the LRTA site shall be stockpiled as directed by LRWWU and/or the owner of the property through the engineer.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

3.07 EXCAVATION BELOW GRADE AND REFILL

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B. Over excavation shall be conducted to remove unsuitable soils as shown on the Drawings, as specified herein, or as directed by the Engineer.

C. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, or the Contractor fails to postpone final excavation immediately above the subgrade until shortly before placing of the new work thereon, or other failure or neglect on the part of the Contractor to conduct the excavation work properly so that the surface of the subgrade is in proper condition for construction, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at no additional cost to the Owner.

D. When excavations have reached the required subgrade, including any allowances for working mats or base materials, prior to the placement of working mats or base materials, notify the Engineer to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings. If, in the opinion of the Engineer, the existing subgrade soils in its undisturbed natural condition are determined to be unsuitable, direction will be provided by the Engineer regarding removal and replacement with suitable materials. If Contractor believes that such direction would increase Contractor's cost and would thereby entitle Contractor to a change in Contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the General Conditions pertaining to changes in the work.

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E. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and a geotextile filter fabric shall be placed. Crushed stone shall then be placed in 6-in. lifts and thoroughly compacted up to the normal grade of the pipe.

F. Filter fabric shall be placed where shown on the Drawings and /or specified as follows.

1. The filter fabric shall be unrolled and placed onto the prepared trench bottom as shown on the Drawings. The fabric shall be carried up the trench sidewall to the top of the pipe bedding.

2. Filter fabric shall be unrolled and placed on the prepared subgrade beneath structures, headwall and manholes on pipelines requiring use of filter fabric. Fabric shall extend 6 in. beyond the structure and manhole foundations, unless otherwise noted.

3. Where more than one section of fabric is required, the fabric shall be overlapped no less than 12 in. to assure the continuity of the filter.

4. The subgrade shall be inspected and acceptable to the Engineer prior to the installation of the filter fabric. The subgrade shall be maintained in a smooth, uniform, and compacted condition during the installation of the filter fabric. No mechanical equipment shall be driven directly on top of the filter fabric unless permitted by the Engineer. The fabric shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation.

5. If the fabric is damaged during installation it shall be immediately repaired. All gravel shall be removed from the affected area and a patch of fabric large enough to cover the damage plus an 18 in. overlap shall be placed on top of the damaged section.

3.08 GENERAL FILLING AND BACKFILLING PROCEDURES

A. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.

B. Fill and backfill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice and frozen earth.

C. Compaction in open areas may be accomplished using approved heavy vibratory rollers. Compaction in confined areas (including areas within a 45 degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by approved hand operated vibratory equipment or mechanical tampers.

D. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material shall be spread and compacted in layers not over 6-in thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming. Puddling is not allowed.

E. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact either from rain or from excess application of water (i.e. the in-place moisture content of the soil at that time is no more than three percentage points above the optimum moisture content

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of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction). At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

F. Notify the Engineer in advance of compaction activities and make prepared subgrade surfaces available to the Engineer for observation and testing

G. The method and degree of compacting backfill as directed by the Engineer will be governed by the type of material compacted.

H. Dust control measures shall be employed at all times.

3.09 BACKFILLING - TRENCHES

A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be performed expeditiously. Bedding material, as specified for the type of pipe installed, shall be placed up to 1 foot over the pipe. As the bedding material is placed, it shall be compacted by suitable, approved tools.

B. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300 feet, whichever is less.

C. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or crushed stone has been placed and compacted to a level 1 foot over the pipe.

D. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 95 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

E. Where the pipes are laid cross-country, the remainder of the trench shall be filled with common fill material in layers not to exceed 1 foot and thoroughly compacted by rolling or ramming, as the Engineer may direct, sufficiently to prevent subsequent settling. The backfill shall be mounded 6 inches above the existing grade or as directed. Where a loam or gravel surface exists prior to cross-country excavations, it shall be removed, conserved and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition. If storage of loam, gravel, or topsoil is not preferred, replace it with material of equal quality and in equal quantity.

F. Where the pipes are laid in streets, or other paved areas, the remainder of the trench up to a depth of 12 inches below the bottom of the specified permanent paving shall be backfilled with select common fill material in layers not to exceed 1 foot and compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. The subbase layer for paving shall be as specified in 6-in layers and compacted to at least 95 percent as determined by ASTM D1557.

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G. Where the pipes are laid under existing water mains or other utilities, Controlled Density Fill (CDF), as specified in Section 02230 and as directed by the Engineer, may be used to backfill trench after the specified stone for the type of pipe being installed has been placed to a level of 1 foot above top of pipe. Placing CDF shall be by chute, pumping or other method approved by the Engineer. When placing CDF, proper height of applicator is required to prevent blow-out of stone covering pipes. Formed walls or other bulkheads shall be constructed, if deemed necessary by the Engineer, to withstand hydrostatic pressure exerted by the CDF. Means to confine the material within a designated space shall be provided. The temperature for mixing and placing CDF must be at least 35 degrees F. Existing utilities contained in metal pipes located in the trench, shall be covered with polyurethane wrap which shall be a minimum of 8-mils thickness and shall in conformance with AWWA C105 prior to backfilling with CDF. Existing utilities within trench shall be braced to prevent floating.

H. If water restrictions are in force, obtain water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.

I. Subject to the approval of the Engineer, fragments of ledge and boulders smaller than 6 inches may be used in trench backfill providing that the quantity in the opinion of the Engineer is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to ensure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

J. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.

K. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

L. Unattended trenches shall be secured in a safe manner according to CMR 520, 14.00. See Appendix E for the City of Lowell ordinance relating to trenches.

3.10 BACKFILLING – STRUCTURES AND HEADWALL

A. Structural fill, screened gravel or crushed stone shall be placed below structures as indicated or as directed by the Engineer in layers having a maximum thickness of 8 inches in open areas and 4 inches in confined areas including points where conduit and piping join structures, measured before compaction. Each layer of fill shall be compacted to at least 95 percent of maximum dry density determined by the ASTM D1557 by methods approved by the Engineer.

B. Compaction of structural fill, screened gravel or crushed stone in open areas shall consist of a heavy vibratory roller, or any method approved by the Engineer. Compaction of structural fill or crushed stone in confined areas shall be accomplished by hand operated vibratory equipment or mechanical tampers approved by the Engineer. Lift thickness should be reduced to 4 inches in confined areas accessible only to hand guided compaction equipment. As a minimum, compaction of structural fill or crushed stone shall consist of four coverages of the approved equipment.

C. Working mat is required below all structures, as indicated on the Drawings, and shall consist of structural fill, screened gravel or crushed stone (12-in minimum).

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D. Backfill around structures shall be selected common fill material, unless otherwise indicated on the drawings, shall be performed with approved compaction equipment. All backfill shall be compacted, especially under and over pipes connected to the structures.

E. Do not backfill against walls until the walls and supporting slabs have attained design strength. When backfilling around structures, bring up backfill uniformly around structures unless indicated otherwise on the Drawings. Backfill levels around the entire perimeter of the structure shall be controlled such that the grade differential does not exceed 3-ft. Contractor shall correct any damage to the structures caused by backfilling at no additional cost to the Owner.

3.11 RESTORING TRENCH SURFACE

A. Where the trench occurs adjacent to or in paved streets, shoulders, sidewalks, or cross-country areas, thoroughly compact the backfill and maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.

B. In and adjacent to streets, the 12-in layer of trench backfill below the specified initial pavement shall consist of compacted materials as specified. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor, at his/her own expense, have samples of the material tested by an independent testing laboratory at intervals not to exceed 500 feet, in order to establish its compliance with the specifications. Only material which has been tested and approved by the Engineer shall be allowed to be incorporated into the work.

C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored to a condition at least equal to that existing before work began.

D. In sections where the pipeline passes through grassed areas, and at the Contractor's own expense, remove and replace the sod, or loam and seed the surface to the satisfaction of the Engineer.

E. In sections where the pipeline passes through landscaped areas, the Contractor shall, at his own expense, remove and replace the peat, mulch or other material to the satisfaction of the Engineer.

END OF SECTION

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SECTION 02230

GRANULAR FILL MATERIALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Granular fill materials are specified in this Section, but their use for bedding pipe and headwall backfill, replacement of unsuitable material, gravel cushion in ledge excavation, pavement base, foundation support, grading and miscellaneous site work, and similar uses are specified in detail elsewhere. The Engineer may order the use of fill materials for purposes other than those specified in other Sections if, in his/her opinion, such use is advisable.

1.02 RELATED WORK

A. Environmental Protection Procedures are included in Section 01110.

B. Site Preparation is included in Section 02100.

C. Dewatering and Drainage is included in Section 02140.

D. Rock and Boulder Excavation is included in Section 02213.

E. Earthwork is included in Section 02221.

F. Pavement repair and resurfacing is included in Section 02576.

G. Landscaping is included in Section 02900.

H. Loaming and Seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, complete product data for materials specified in this Section. For each fill material, the Contractor shall notify the Engineer of the source of the material and shall deliver a representative sample weighing approximately 50 lbs at least 15 calendar days prior to the date of anticipated use of such material.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

3. ASTM D422- Test Method for Particle Size Analysis of Soils

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B. Massachusetts Department of Transportation Standard Specifications for Highways and Bridges, and all addenda and supplements thereto, latest edition (MDOTSSHB).

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

1.05 QUALITY ASSURANCE

A. Laboratory Testing

1. The Contractor will be responsible to engage the services of a soils testing laboratory to perform the following:

a. Grain size analyses of samples to determine their suitability for use as backfill or fill material in conformance to the materials requirements specified hereinafter.

b. Modified Proctor analyses to determine the maximum dry densities required for compaction testing as specified elsewhere in the Contract Documents.

2. Test results and determinations of suitability shall be delivered to the Engineer no later than three days prior to the placement of backfill or fill materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Backfill and Fill materials shall be suitable excavated materials, natural or processed mineral soils obtained from off-site sources, or graded crushed stone or gravel. Backfill and Fill materials shall be free of all organic material, trash, snow, ice, frozen soil, or other objectionable materials which may be compressible or which cannot be properly compacted. Soft, wet, plastic soils which may be expansive, clay soils having a natural, in-place water content in excess of 30 percent, soils containing more than 5 percent (by weight) fibrous organic materials, and soils having a plasticity index greater than 30 shall be considered unsuitable for use as backfill and fill.

B. Bank Run Gravel Base Course for roads and sidewalks shall conform to Section M1.03.0 Type C of the MDOTSSHB specifications. Unless otherwise indicated, a minimum of 12 inches shall be provided below roadways and sidewalks.

C. Structural Fill shall be gravel, sandy gravel, or gravelly sand free of organic material, loam, wood, trash, snow, ice, frozen soil, and other objectionable material and shall be graded within the following limits:

Sieve	Percent Passing
3-in	100
No. 4	20 - 70
No. 40	5 -35
No. 200	0 - 10

D. Common Fill shall be a granular soil, substantially free of clay, organic material, loam, wood, trash, snow, ice, frozen soil, and other objectionable material which may be compressible, or

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which cannot be compacted properly. Common fill shall not contain stones larger than 6-in in any dimension, broken concrete, masonry, rubble, asphalt pavement, or other similar materials. Common Fill shall not have more than 30 percent passing the No. 200 sieve. It shall have physical properties, as approved by the Engineer, such that it can be readily spread and compacted. Soil excavated on-site that meets these requirements may be used as common fill.

E. Select Common Fill shall conform to the requirements of common fill except that the material shall not contain any materials larger than 2 inches in largest dimension.

F. Crushed Stone shall conform to Section M2.01.4 of the MDOTSSHB specifications.

G. Screened Gravel shall be hard, durable, rounded, or sub-angular particles of proper size and gradation, and shall be free from sand, loam, clay, excess fines, and other deleterious materials. Screened gravel shall be graded within the following limits:

Sieve Size	Percent Finer by Weight
5/8-in	100
1/2-in	40 to 100
3/8-in	15 to 45
No. 10	0 to 5

H. Sand for concrete, grout and masonry shall conform to ASTM C33 for fine aggregate. General purpose sand shall be Select Common Fill.

I. Reclaimed Asphaltic base material shall consist of reclaimed existing bituminous concrete forming a stabilized base course as outlined in these specifications. The pavement and foundation material shall be pulverized and mixed by a traveling hammer mill or other equipment specifically designed to reclaim bituminous concrete. The reclaimed material shall form a homogenous.asphaltic stabilized foundation at least 12 inches thick.

The material shall be processed until the gradation and uniformity of the mixture is satisfactory to the Engineer and contains no particles greater than 2-in maximum. The gradation shall adhere to M1.03.0 Type C of the MDOTSSHB specifications.

In general, equipment such as ‘road planner’ or ‘cold-milling’ road machine which is designed to ‘mill’ and/or ‘shed’ the existing bituminous concrete pavement course rather than crush or fracture it, is not considered capable of achieving the specification gradation. The scraping action of the ‘milling’ type of equipment causes an increase in the percentage of fine aggregate obtained and the ‘milling’ type equipment does not have the capability of crushing/pulverizing the large course aggregate from broken pavement (2-in to 6-in portions) and cobbles (2 – 6 inches) that might occur in the base.

It is the responsibility of each contractor submitting proposals for the work to assure himself that the equipment and construction methods he intends to use are capable of complying with the project specifications.

J. Controlled Density Fill (CDF) used as backfill and fill, and closure for abandoned pipes, and where new pipes cross under existing utilities, or as directed by the Engineer. Materials, methods of preparation, and placement techniques shall comply with the requirements of Section 03301 as for concrete and MDOTSSHB M4.08.0. CDF shall be a mixture of Portland cement [AASHTO,

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M85], fine aggregate [M4.02.05], water [M4.02.05], and air entrained admixtures [M4.02.05]. Design mix shall result in a Type 2E, flowable and excavatable material and shall not contain fly ash for utility crossings; and Type 1E, very flowable and excavatable material for abandoned pipes.

K. Impermeable fill material shall be from an off-site source accepted by the Owner and tested to ensure a permeability coefficient of less than or equal to 1 x 10^{-7} cm/sec after compaction. The material shall be as specified under the Unified Soil Classification System as CL, CH, and SC in ASTM D2487. Prior to acceptance of the material it shall be tested by an outside independent soils analysis company for the maximum dry density as determined by the modified proctor test, ASTM D1557, Method B, C or D as applicable. Moisture content must be not wetter than 5 percentage points above nor less than 2 percentage points below the optimum moisture content as determined by ASTM D1557, Method B, C or D as applicable. Certified results shall be sent to the Engineer for approval and acceptance.

L. ASTM C33 Size Number 8 washed crushed stone to be used for stone in the filter course for precast pervious concrete paving slabs:

Square Mesh Sieves	Percent Passing by Weight
Pass ½ -in	100
Pass 3/8 -in	85-100
Pass #4	10-30
Pass #8	0-10
Pass #16	0-5

M. ASTM C33 Size Number 57 washed crushed stone to be used in the reservoir course for precast pervious concrete paving slabs:

Square Mesh Sieves	Percent Passing by Weight
Pass 1 ½ -in	100
Pass 1 -in	95 -100
Pass ½ -in	25-60
Pass 3/8-in	0-15
Pass #4	0-5

N. Impervious dam used for pipe trench dam and trench dam used for the precast pervious concrete paving slabs shall be clay, concrete, prefabricated PVC, or other impervious material.

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 02270

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all installation, maintenance, removal and area cleanup related to erosion and sedimentation control work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; installation of temporary access ways and staging areas, silt fences, stone filter boxes, stone filter berms, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, excelsior matting installation and final cleanup.

B. Erosion control measures for the stockpiled material at the LRTA Drainage Improvements Site (Part B) shall be left in place.

1.02 RELATED WORK

A. Dust control is included in Section 01562.

B. Granular fill materials are included in Section 02230.

C. Loaming and seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, within ten days after award of Contract, technical product literature for all commercial products, including straw mulch tackifier, to be used for erosion and sedimentation control.

1.04 QUALITY ASSURANCE

A. Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off site areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered.

B. Sedimentation and erosion control measures shall conform to the requirements outlined in the Lowell Conservation Commission Order of Conditions appended to this Specification.

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PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed stone for sediment filtration devices, access ways and staging areas shall conform to Mass Highway "Standards and Specifications for Highway and Bridges" Section M2.01.3.

B. Berm structural stone shall be rip-rap as follows:

1. Rip-rap shall be sound, durable rock which is roughly rectangular shape and of suitable quality to insure permanence in the condition in which it is to be used. Rounded stones, boulders, sandstone or similar soft stone will not be acceptable. Material shall be free from overburden, spoil, shale and organic material, meet the Engineer's approval and be well graded within the following limits:

Weight of Stone	Percent Finer by Weight
40 lb	100
12 lb	50
3 lb	0

C. Sediment Fence

1.. Steel posts shall be a minimum of 5-ft length, 2-1/2-in by 2-1/2-in by ¼-in angle post with self-fastening tabs and a 5-in by 4-in (nominal) steel anchor plate at bottom.

2. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc,, Charlotte, NC or equal.

3. Tie wires for securing silt fence fabric to wire mesh shall be light gauge metal clips (hog rings), or 1/32-in diameter soft aluminum wire.

4. Prefabricated commercial silt fence may be substituted for built-in-field fence. Pre-fabricated silt fence shall be “Envirofence” by Mirafi Inc., Charlotte, NC or equal.

D. Crushed stone for sediment filtration devices, access ways and staging areas shall conform to Section 02230.

E. 1/4-in woven wire mesh for filter boxes shall be galvanized steel or hardware cloth.

F. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10 inches or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

G. Latex acrylic copolymer or organic tackifier shall be a commercial product specifically manufactured for use as straw mulch tackifier.

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H. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the Engineer.

I. Erosion control blanket shall be installed in all seeded drainage swales and ditches as shown on the Drawings or as directed by the Engineer. Erosion control blanket shall be 100 percent agricultural straw matrix stitch bonded with degradable thread between two photodegradable polypropylene nettings, such as Model S150 Double Net Short-Term Blanket (10 months) by North American Green, Evansville, IN or equal.

J. Siltation Control Device For Catch Basins

1. Where shown on the drawings or directed by the Engineer, a siltation control device shall be used to trap sediment and prevent the drainage system from clogging. Siltation control device(s) shall be installed between the catch basin frame and grate. The Contractor shall clean and maintain the siltation control device(s) on a regular basis and as directed by the Engineer.

2. The siltation control device shall be a woven sack that is sewn with a double needle machine using high strength thread.

3. The siltation control device will be manufactured to fit the opening of the catch basin or drop inlet. The siltation control device will have the following features; two dump straps attached to the bottom of the sack to facilitate the dumping of the trapped sediment. The top of the siltation control device shall have lifting loops as an integral part of the sack to be used to lift the partially fill sack out to empty. The siltation control device shall have a restraining strap approximately halfway up the sack to keep the sides away from the catch basin walls. This yellow strap is a visual means of determining when the sack needs to be emptied. Once the strap is covered with sediment, the siltation control device should be emptied, cleaned and placed back in the catch basin.

4. The geotextile fabric shall be woven fabric with the following properties:

HI FLOW

Property	Test Method	Test Result
Grab Tensile	ASTM D-4632	265 lbs.
Grab Elongation	ASTM D-4532	20 percent
Puncture	ASTM D-4833	135 lbs.
Mullen Burst	ASTM Dl-3786	420 P.S.I.
Trapezoid Tear	ASTM D-4533	45 lbs.
UV Resistance	ASTM D-4355	90 percent
Apparent Opening Size	ASTM D-4751	20 US Sieve
Flow Rate	ASTM D-4491	200 gal/min/sf
Permittivity	ASTM D-4491	1.5 sec^{-1}
Average Strength	ASTM D-4884	100 lb/in

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5. Siltation control devices shall be SILTSACK, manufactured by ACF Environmental, Inc. or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Sediment Fence Installation

1. Sediment fences shall be positioned as indicated on the Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the Engineer.

2. Dig trench approximately 6-in wide and 6-in deep along proposed fence lines.

3. Drive stakes, 8-ft on center (maximum) at back edge of trenches. Stakes shall be driven 2 feet (minimum) into ground.

4. Hang filter fabric on posts carrying to bottom of trench with about 4 inches of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and maintain secure both ways.

5. Backfill trench with excavated material and tamp.

6. Install pre-fabricated silt fence according to manufacturer's instructions.

B. Construct filter boxes as detailed on the Drawings, from 1/4-in woven wire mesh or hardware cloth and wood. Fill with crushed stone and place over all drop inlets and manholes to storm drain system as each inlet is completed. This should be done prior to setting casting, if there is a delay between installation of inlet structures or drain manholes and setting of castings. An alternate method is to ring each inlet with a sediment fence.

C. Stone Filter Berm Installation

1. Place berm structural stone across channel just below lower sandbag wall at work area. Face upstream side of structural berm with crushed stone.

D. Staging areas and access ways shall be surfaced with a minimum depth of 4 inches of crushed stone.

3.02 MAINTENANCE AND INSPECTIONS

A. Inspections

1. Make a visual inspection of all erosion and sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

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B. Device Maintenance

1. Sediment Fences

a. Remove accumulated sediment once it builds up to 1/2 of the height of the fabric.

b. Replace damaged fabric, or patch with a 2-ft minimum overlap.

c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

2. Filter Boxes

a. Replace crushed stone when it becomes saturated with silt.

3. Stone Filter Berm

a. Muck out trapped silt from dewatering operations when it has built up to within 6 inches of the top of the berm.

b. Replace crushed stone filter when saturated with silt.

4. Add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

3.03 TEMPORARY MULCHING

A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.

B. Straw mulch shall be applied at rate of 100 lbs/1000 sq ft and tackified with latex acrylic copolymer at a rate and diluted in a ratio per manufacturer’s instructions.

3.04 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be installed in all seeded drainage swales and ditches as shown on the Drawings and as directed by the Engineer in accordance with manufacturer's instructions. The area to be covered shall be properly prepared, fertilized and seeded with permanent vegetation before the blanket is applied. When the blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. The blankets shall be applied in the direction of water flow and stapled. Blankets shall be placed a minimum of three rows 4-ft wide (total approx. 12-ft width) within the drainage swale/ditch and stapled together in accordance with manufacturer's instructions. Side overlaps shall be 4-in minimum. The staples shall be made of wire, .091-in in diameter or greater, "U" shaped with legs 10-in in length and a 1-1/2-in crown. Commercial biodegradable stakes may also be used with prior approval by the Engineer. The staples shall be driven vertically into the ground, spaced approximately two linear feet apart, on each side, and one row in the center alternately spaced between each size. Upper and lower ends of the matting shall be buried to a depth of 4 inches in a trench. Erosion stops shall be created every 25 feet by making a fold in the fabric and carrying the fold into a silt trench across the full width of the blanket. The bottom of the fold shall be 4 inches below the ground surface.

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Staple on both sides of fold. Where the matting must be cut or more than one roll length is required in the swale, turn down upper end of downstream roll into a slit trench to a depth of 4 inches Overlap lower end of upstream roll 4 inches past edge of downstream roll and staple.

1. To ensure full contact with soil surface, roll matting with a roller weighing 100 lbs/ft of width perpendicular to flow direction after seeding, placing matting and stapling. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.

3.05 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings.

END OF SECTION

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SECTION 02311

SUPPORT OF EXCAVATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work specified in this Section includes requirements for excavation and support of temporary excavations and trenches. The Contractor shall design, furnish, install, and maintain a system of supports, including all sheeting, shoring, waling, bracing, posting, piling, anchoring, fastenings, and associated items, to retain excavations in a safe manner, to control ground movements, and to protect adjacent structures, roadway, railroad and utilities. Upon completion of the required construction the system of supports shall be removed as specified herein and the excavation and staging area sites restored as discussed herein.

B. The work shall include site grading; fencing and signing; construction staging areas; design and construction of excavation support systems; disposal of excavated material, surface water, and ground water; backfilling and site restoration. Work shall include all labor, materials, and equipment required to complete excavation support.

C. All excavation, trenching and related sheeting, bracing, etc, shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et. seq.) and other federal, State and local requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

D. The Contractor shall be responsible for sizing the support of excavation systems. The size of the systems shall, however, be adequate for removal of material as indicated on the Drawings and to provide adequate space to meet the Contractor's work requirements for his/her selected methods of construction.

E. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation required to monitor the performance of the excavation support system as required herein.

F. The Contractor shall retain the services of a professional engineer registered in the Commonwealth of Massachusetts to prepare excavation support and protection system designs and submittals described herein.

1.02 RELATED WORK

A. Submittals are included in Section 01300.

B. Dewatering and drainage is included in Section 02140.

C. Earthwork is included in Section 02221.

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D. Rock and boulder excavation is included in Section 02213.

E. Granular fill materials are included in Section 02230.

F. Pipe Jacking is included in Section 02340.

G. Work In Or Near Railroad Property is included in Section 02450.

H. Geotechnical Instrumentation is included in Section 02495.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, Shop Drawings and design calculations for the Contractor-designed excavation support system stamped by a Professional Engineer in the Commonwealth of Massachusetts. Submittals shall indicate the following, as a minimum:

1. Shop Drawings shall include:

a. Provide overall plan layout of the system, indicating clearances, dimensions, material properties, member sizes, locations, spacing and penetrations depth of all members, locations of various types of lateral supports. Indicate existing and proposed utilities, structures or other obstruction, location and type of instrumentation and monitoring points within the area of influence of the excavation.

b. Provide wall elevations and locations of all bracing.

c. Show the methods and overall sequence of installation and removal of excavation supports and bracing, indicating levels to which the work will be carried out before excavation support or bracing is installed or removed.

d. Method of preloading bracing (if required) and the preload for each member, and the method of locking-off the preload. Include detailed drawings of the connections, jacking supports and method of shimming.

e. Details, layout, arrangement, equipment requirements, and method of construction of the proposed excavation support system.

f. Procedures for resolving difficulties arising from misalignment of members exposed during excavation, and criteria for implementing those procedures.

g. A plan of deformation monitoring points to monitor the performance of the excavation support system. The plan shall include the monitoring point locations, elevation, and frequency of monitoring. The Contractor's surveyor shall survey the elevation/location of each monitoring point in accordance with the approved plan. Submit excavation monitoring data of horizontal and vertical deflections of support within 24 hours of each survey along with all previous survey data.

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2. Design calculations shall include:

   a. Loads on the excavation support system for all stages of excavation, pipe jacking operation, bracing removal, and backfilling, including material, hydrostatic and equipment loads on adjacent ground during construction.

   b. Design of wall and all bracing members including all details for all stages of construction.

   c. Theoretical deflections of excavation support system and deformation of structures, pipelines, and other improvements located within the area of influence of the excavation.

   d. Submit to the Engineer for review and acceptance, a plan of action to be implemented in the event any deformation exceeds the calculated theoretical deflections. The plan of actions shall be positive measures by the Contractor to limit further movement of the wall including but not limited to trenching for struts and wales, placement of granular earth berms against the wall, installation of additional struts, or combinations thereof. The details of the mitigating measures shall include a schedule of implementation, location and/or availability of materials, structural details for all connections to the wall and support elements, and a detailed description of the method of implementation. The Contractor shall be prepared to work twenty-four (24) hours per day to implement such measures. The remedial work/mitigating measures shall be at no additional cost to the Owner.

B. The design of the temporary excavation support system shall be coordinated with the dewatering system. Design of excavation support at the jacking and receiving pits shall be coordinated with the pipe jacking design.

C. Submit quality control measures as required to ensure that the performance of the excavation support system is consistent with the approved shop drawings and the requirements herein.

D. Submit welder qualifications and weld procedures in accordance with AWS D1.1.

E. Submit Contractor's and Design Engineer's qualifications as described in herein.

F. At least one copy of the design shall be maintained at the job site during excavation that includes a plan indicating the sizes, types, and configurations of the materials to be used in the protective system, and the identity of the registered engineer who approved the design.

G. Do not proceed with any support of excavation or protection activities until the submittal has been approved by the Engineer.

H. Design Engineer's documentation shall include:

   1. On-site inspections of excavation support system as the systems are constructed.

   2. Review of quality control measures and performance data.

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3. Certification that the excavation support system is constructed per the applicable design following completion of each support system and following any modifications by Contractor during construction.

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A36 - Specification for Structural Steel Standard Specifications

B. American Welding Society (AWS)

1. AWS D1.1 for Public Works Construction

C. Codes

1. U.S. Occupational Safety and Health Administration (OSHA) Regulations, 29 CFR Part 1926 Subpart P - Excavations.

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

1.05 DESIGN REQUIREMENTS

A. Design shall consider all phases of construction and design each member or support element to support the maximum loads that can occur during construction with appropriate factors of safety. Design excavation support systems to provide sufficient room to complete the work as shown on the Drawings.

B. The design shall consider conditions that may occur during the various stages of construction including, but not limited to; temporary or permanent alteration of the soils' in-situ properties caused by the selected methods of construction, installation, relocation and removal of temporary bracing, excavation below bracing, dewatering of excavation, time related effects, shrinkage of concrete and load transfer to permanent structure.

C. Design excavation support systems in accordance with all OSHA requirements and other local and state agency requirements. Work within the right-of-way of Massachusetts Department of Transportation (MDOT) shall meet the requirements of MDOT. Work within or near railroad properties shall be in accordance with Section 02450.

D. Design the support system to minimize horizontal and vertical movements, and to protect adjacent structures, roadway, railroad and utilities from damage.

E. Design, install, operate, and maintain ground water control system for excavations to control ground water inflows, prevent piping or loss of ground, and maintain stability of the excavation in accordance with Section 02140.

F. Maintain a minimum factor of safety of 1.5 against heave, uplift, piping and instability due to seepage gradients at the base of the excavations.

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G. Provide temporary fencing around all excavations. Provide pedestrian and traffic control around working areas and support systems located within or adjacent to streets, roadways, freeways, driveways, walkways, or parking lots.

H. Excavations below the level of the base of any adjacent foundation or retaining wall shall not be permitted unless the design of the excavation and bracing includes an analysis of the stability of the structure supported by the foundation and as necessary, incorporates required bracing/ underpinning of the foundation.

I. For support systems in which bracing is installed between opposite sides of the excavation, design the excavation support of both sides to be nearly the same as feasible.

J. Where necessary to resist point loads, pipe piles used as soldier piles shall be filled with concrete with a compressive strength not less than 3,000 psi. The strength of the concrete shall not be considered in design of the pipe pile for bending stress.

K. Receipt of the Contractor's plans and methods of construction by the Engineer does not relieve the Contractor of his responsibility to provide an adequate support system achieving the specified requirements. Design review and field monitoring activities by the Owner or by the Engineer shall not relieve the Contractor of his/her responsibilities for the work.

L. All underground utility lines shall be identified, located, and protected from damage or displacement. Utility companies and other responsible authorities shall be contacted to locate and mark the locations and, if they so desire, direct or assist with protecting the underground installation. When required, the Contractor shall obtain an excavation permit from the local authority having jurisdiction prior to the initiation of any excavation work.

1.06 QUALITY ASSURANCE

A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.

B. The Contractor shall have at least five (5) years experience with compatible work to the work, shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work.

C. Design of excavation support systems shall be performed by a Professional Engineer registered in the Commonwealth of Massachusetts with at least five (5) years experience in design of similar excavation support systems and shall have completed not less than five (5) successful excavation support projects of equal type, size, and complexity to that require for the work.

PART 2 PRODUCTS

2.01 MATERIALS

A. All timber, structural steel, and steel sheet piling used for the supporting systems, whether new or used, shall be sound and free from defects that may impair their strength.

B. Concrete shall conform to ASTM C33 and ASTM C150 unless otherwise approved.

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C. Soldier piles and structural steel shall conform to ASTM A572 or ASTM A242 unless approved otherwise. All structural steel shall be Grade 50 (50 ksi) or better. No members with permanent deformations are to be provided. Members shall not be spliced unless approved by the Engineer.

D. All timber shall be structural grade with a minimum allowable flexural strength of 1100 psi. Timber lagging shall be at least 3 inches thick.

E. Steel sheet piling shall conform to ASTM A328 or ASTM A572 unless approved otherwise. All steel sheet piling shall be Grade 50 (50 ksi) or better.

F. Pipe piles used as soldier piles shall conform to ASTM A252, Grade 3 (45 ksi), or better unless approved otherwise.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Commence excavations only after shop drawings have been reviewed and accepted by the Engineer.

B. Install excavation support systems in accordance with the approved shop drawings and applicable permits.

C. Methods of construction for excavations shall be such as to ensure the safety of the Work, Contractor's employees, Engineer and Owner's employees and inspectors, the public and adjacent property and improvements, whether public or private.

D. Before beginning construction at any location of this project, adequately protect existing structures, utilities, trees, shrubs, and other existing facilities to remain. Design excavation support systems to limit deformations that could damage facilities including utilities and structures. The repair of or compensation for damage to existing facilities shall be at no additional cost to the Owner.

E. As a minimum, place fencing, gates, lights, and signs as necessary around the excavations and staging areas to provide for public safety.

F. Monitor performance of excavation support system for both horizontal and vertical deflections daily during excavation, and at intervals not to exceed seven days following the completion of excavation work. If monitoring data indicates that deflections have exceeded estimated values, increase frequency of monitoring as required by the Engineer. Submit all monitoring measurements to the Engineer on the same day measurements are taken.

G. If settlement or deflections of supports indicate that support system requires modification to prevent excessive movements, redesign and resubmit revised shop drawings and calculations to the Engineer at no additional cost to the Owner.

H. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports placed at no additional cost to the Owner.

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Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports.

I. Care shall be taken to prevent voids outside of the excavation support system, but if voids are formed, they shall be immediately filled with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete or other material as approved by the Engineer.

J. Conduct all work, including excavation, shoring, temporary facilities, materials storage, and construction traffic within construction easements established for the project. All work shall be in accordance with the applicable permits and the approved shop drawings.

K. If unstable material is encountered during excavation, all necessary measures shall be taken immediately to contain it in place and prevent ground displacement.

L. Sufficient quantity of material shall be maintained on site for protection of work in for use in case of accident or emergency.

M. Excavations shall be kept free of water at all times and a stable subgrade shall be maintained. Excavations shall be dewatered in accordance the project specifications.

N. All welding shall conform to the applicable provisions of ANSI/AWS D1.1.

3.02 SOLDIER PILES AND LAGGING

A. Install soldier piles with the minimum embedment depths as shown on the approved shop drawings.

B. Soldier piles shall be installed as indicated in accordance with shop drawings.

C. Driven piles shall be installed with driving shoes where hard driving is anticipated.

D. For soldier piles installed in predrilled holes, provide casing or other methods of support as necessary to prevent caving of holes and loss of ground.

E. Predrilled holes for soldier pile shall be backfilled with concrete from the pile tip elevation to the elevation of the bottom of the excavation. The remainder of the predrilled hole shall be backfilled with lean concrete or sand. Concrete strength shall be in accordance with the shop drawings.

F. The predrilled hole diameter shall be sufficient to allow for proper alignment and concrete backfilling of the pile.

G. Driven soldier piles shall be advanced without the aid of a water jet unless otherwise authorized.

H. Provide timber lagging of sufficient thickness to withstand earth pressures. Timber lagging shall be at least 3 inches thick.

I. Install lagging with no gap between adjacent boards. As excavation proceeds, the maximum height of unlagged face of excavation shall not exceed 4 feet. The unlagged face shall not exceed

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2 feet if water seeps or flows from the face of the excavation or if the face of the excavation becomes unstable.

J. As installation progresses, backfill the voids between the excavation face and the lagging. Pack with materials such as hay, burlap, or geotextile filter fabric where necessary to allow drainage of ground water without loss of ground.

3.03 STEEL SHEET PILING

A. Install steel sheet piling with the minimum embedment depths as shown on the shop drawings.

B. Drive in plumb position with each sheet pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground. Exercise care in driving so that interlocking members can be extracted without damaging adjacent structures or utilities. The methods of driving, cutting, and splicing shall conform to the shop drawings.

C. Use templates or other temporary alignment facilities to maintain piling line.

D. Prior to installation, the sheet piles shall be thoroughly cleaned and inspected for defects and for proper interlock dimensions. The Contractor shall provide a tool for checking the interlock dimensions.

E. Each sheet pile shall have sufficient clearance in the interlocks to slide, under its own weight, into the interlock of the sheet pile previously placed.

F. Excavation shall not be carried in advance of steel sheet piling installation.

G. Where obstructions are anticipated, pre-excavation or pre-drilling along the sheet pile wall alignment shall be conducted at no additional cost to the Owner. Pre-excavation and pre-drilling shall not extend below the lowest excavation level or into bearing soils for existing or future structures.

H. Obstructions encountered before the specified embedment for piles shall be removed. Where obstructions cannot be removed, the sheet pile system shall be re-evaluated by the Contractor's Design Engineer for the resulted reduced embedment and additional toe stability measure implemented, as required or for realignment of the sheet pile wall. A submittal of the proposed measures shall be provided.

I. Damaged piling or piling with faulty alignment shall be withdrawn and new piling driven properly in its place. The cost of such additional work shall be considered as part of the pile driving and shall be borne by the Contractor.

3.04 INTERNAL BRACING SUPPORT SYSTEM

A. Provide wales and struts as needed to enable them to carry maximum design load without distortion or buckling.

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B. Include web stiffeners, plates, or angles as needed to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.

C. Install and maintain all bracing support members in tight contact with each other and with the surface being supported.

D. Coordinate excavation work with installation of bracing. Excavation shall extend no more than 2 feet below any brace level prior to installation of the bracing.

E. Use procedures that produce uniform loading of bracing member without eccentricities or overstressing and distortion of members of system.

3.05 MOVABLE TRENCH BRACING

A. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.

B. When installing rigid pipe (R.C., V.C., A.C. etc.), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.

C. When installing flexible pipe (PVC, D.I., etc.) trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompacted to provide uniform side support for the pipe.

D. Portable trench boxes or sliding trench shields may be used for the protection of workers only.

E. Additional excavation, backfilling, and surface restoration required as the result of trench box use shall be at no additional cost to the Owner.

F. Trench boxes or shields shall be designed, constructed, and maintained to meet acceptable engineering and industry standards.

G. Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

H. A copy of the trench box manufacturer's specifications, recommendations, and limitations shall be in written form and maintained at the job site during all excavation work.

I. No trench box is allowed for excavations that extend within the zone of influence of existing structures unless otherwise approved by the Engineer. The zone of influence is defined as a line extending at least 2 feet beyond of edge of the foundation, then outward and downward at a slope of 1 horizontal to 1 vertical.

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3.06 DISPOSAL OF EXCAVATED MATERIALS

A. Remove and dispose of all excavated materials as specified in Section 02221.

3.07 REMOVAL OF SUPPORT SYSTEM

A. Except where specified on the Drawings or elsewhere in the Specifications all excavation and support systems shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private.

B. No payment will be given for sheeting which has been left in the trench for the convenience of the Contractor.

C. Do not remove internal bracing and transfer loads to the permanent structure without prior acceptance of the Engineer.

D. Removal shall begin at and progress from the bottom of the excavation. Members shall be released slowly as to note any indication of possible failure of the remaining members or possible cave-in of the sides of the excavation.

E. Backfilling shall progress together with the removal of support systems from excavations.

F. When removing the excavation support system, do not disturb or damage adjacent buildings, structures, waterproofing material, or utilities. Fill voids immediately with lean concrete or well-graded cohesionless sand, as indicated or as directed by the Engineer.

G Unless otherwise indicated, remove all portions of excavation support.

H. Do not remove vertical support members that were installed within the zone of influence of new or existing structure or below the mid diameter of any pipe. The zone of influence is defined as a zone extending down and away from the outer edge of the structure at 1 horizontal to 1 vertical. Support members installed within this zone shall be cut off at 5 ft below finished grade and abandoned in place.

I. Under no circumstances shall any sheeting be cutoff lower than 1 foot above the top of any pipe.

J. All voids left after withdrawal of excavation support systems shall be immediately refilled with sand by ramming with tools especially adapted to that purpose or otherwise as directed.

K. No wood shall remain as part of the abandoned portion of the work.

L. Remove material of the excavation support system from the site immediately.

3.08 RESTORATION

A. Furnish, place and compact backfill in all excavations. Restore the work area disturbed by construction activities, and repair any damage caused to existing utilities, to its original, or better, condition as specified in Section 02221.

END OF SECTION

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SECTION 02340

PIPE JACKING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials, and incidentals required and install casing pipe by jacking within the limits of work as defined on the Contract Drawings. The work shall be done in accordance with all Federal, State, and local laws, regulations and requirements as shown on the Drawings and as specified herein.

B. The work shall include, but not be limited to, the following: pipe jacking, tunnel excavation, disposal of tunnel spoil, supplying and installing steel casing as initial support, carrier pipe, casing seals, filling of voids between steel casing and earth, filling annular void between casing and carrier pipe, design and construction of jacking and receiving pits, dewatering at the pits, dewatering of the tunnel, disposal of groundwater effluent, location markers and miscellaneous appurtenances as required to complete the installation.

C. The work shall also include: furnishing, installing, monitoring by survey, reducing, plotting, reporting that same survey data to the engineer and maintaining and protecting all the instrumentation on buildings, utilities, rails and in the ground adjacent to the site or on the site as specified in Section 02495 and as necessary to monitor construction performance and impacts on adjacent property

D. Pipe jacking shall not cause any damage to nearby structures, railroad tracks, utilities and pavement.

E. The Contractor shall be familiar with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work.

F. If any movement or settlement occurs which causes or might cause damage to an existing structure or railroad track over, along or adjacent to the work, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume jacking only after all necessary precautions have been taken to prevent further movement, settlement or damage, and repair the damage at the Contractor's own cost and to the satisfaction of the Engineer.

G. Follow all OSHA regulations regarding confined space for casing installation.

H. Conform with all Massachusetts Bay Transportation Authority requirements for work within MBTA rights-of-way and any additional requirements of the track operator Pan Am Railways.

I. Rescue shafts are not allowed.

J. Direct jacking of carrier pipe is prohibited.

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K. The Contractor shall retain the service of a professional engineer registered in the Commonwealth of Massachusetts to prepare pipe jacking design and submittals described herein.

L. Jacking operations will be on a continuous basis, 24 hours per day, 7 days a week.

1.02 RELATED WORK

A. Dewatering and Drainage is included in Section 02140.

B. Rock and Boulder Excavation is included in Section 02213.

C. Earthwork is included in Section 02221.

D. Sediment and Erosion Control is included in Section 02270.

E. Support of Excavation is included in Section 02311.

F. Geotechnical Instrumentation is included in Section 02495.

G. Precast Concrete and Cast-in-Place Concrete Manholes and Structures are included in Section 02605.

H. Reinforced concrete pipe is included in Section 02612.

I. Ductile Iron Pipe and Fittings is included in Section 02616.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300: Submit shop drawings and product data for materials to be used for pipe jacking operations. Submit a laying schedule showing stationing, elevations, pipe classes and class coding. Identify and indicate jacking and receiving pits and intermediate jacking stations on the Drawings. Shop drawings shall be sealed by the Contractor's engineer.

B. Submit to the Engineer, at least 3 weeks prior to the scheduled start of any jacking operations, the Jacking system designs prepared by a licensed professional engineer, registered in the Commonwealth of Massachusetts having a minimum of five years of professional experience in the design and construction of jacking systems. The Contractor shall remain responsible for adequacy and safety of construction means, methods and techniques. The Contractor's engineer shall approve and affix his/her stamp to the drawings and design concepts for jacking operations. Submittals shall consist of design drawings, calculations and related supplemental information describing in detail the design concept for all jacking operations. Submittals shall include, but not be limited to the following:

1. Shop drawings showing size, location and design calculation for reaction blocks and jacking and receiving pits.

2. Number and capacities of jacks.

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3. Detailed description of equipment, materials, sequence and procedures for jacking operations including:
    a. Control of groundwater and surface drainage.
    b. Method of soil stabilization at the face.
    c. Methods of soil stabilization (grouting) and/or ground water control at the face.
    d. Excavation method and conveyance for various soil/rock that may be encountered.
    e. Method of excavation removal.
    f. Maintenance of alignment and grade.
    g. Materials and installation of casing pipe.
    h. Grouting outside of casing pipe.
    i. Grouting between casing pipe and carrier pipe.
    j. Procedure for lubricating casing pipe during jacking.
    k. Bulkheads.
    l. Grout mix designs, including additives and sources and properties of all components.
    m. Schedule
    n. Description and set up of jacking equipment to be employed in the work. This shall include details of jacking frame, drill cutter guide head layout, name of manufacturer and model.
    o. Method of placing carrier pipe.
    p. Anticipated settlement at the ground surface due to jacked casing installation.

4. Manufacturer's product data sheet, installation instructions, and recommendations for the jacking operation for the following:
    a) Pipe joints
    b) Temporary pipe caps
    c) Lubricants
    d) Steel Pipe
    e) Sealants

C. Submit thrust block design calculations and shop drawings for all pipe jacking pits.

D. Submit the Contractor's qualifications as described herein.

E. Submit the Contractor's Massachusetts State professional engineer's qualifications as described herein.

F. Submit the qualifications of the surveyor responsible for monitoring of pipe position and ground settlement

G. Daily surveyor reports of casing pipe position and control point monitoring, conducted by the Contractor's surveyor, shall be provided in writing to the Engineer and MBTA/Pan Am Railways.

H. Submit grout and concrete mix designs.

1.04 QUALITY ASSURANCE AND QUALITY CONTROL

A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State, and local agencies.

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B. The Contractor shall have at least 5 years experience compatible to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work. Compatible work shall include pipe jacking of at least equivalent or larger diameter casing pipe that cross below railroads and/or roadways with jacking length at least as long as the segment of pipe jacking being jacked by the Contractor.

C. The pipe jacking machine operator(s) is (are) required to have at least three years of pipe jacking experience, and to have worked on at least two pipe jacking projects using the same type of equipment and in similar conditions as required for this Project

D. The Contractor's engineer shall be a professional engineer, registered in the Commonwealth of Massachusetts, and shall have at least 5 years experience in the design of pipe jacking, excavation support, dewatering, grouting, and soil stabilization.

E. The Contractor's surveyor shall be a Professional Land Surveyor, registered in the Commonwealth of Massachusetts, and shall have at least 5 years experience in construction survey of the type required under this Contract and acceptable to the Engineer and Owner.

F. The Contractor shall perform optical level surveys, instrument readings, and report data. Personnel responsible for this work shall be qualified by a minimum of three years of experience with similar work.

G. Welders shall be certified in accordance with standards of the AWS. Submit current certifications prior to the start of field work.

H. Steel casing pipe shall be the product of an approved, single manufacturer. Pipe shall be tested and inspected at the foundry as required by the standard specifications to which the material is manufactured. Submit in accordance with Section 01300 certificates of such tests, results and satisfactory approvals.

1.05 DEFINITIONS

A. Casing pipe shall mean the outer sleeve that is installed by jacking method.

B. Carrier pipe shall mean the pipes inserted within the casing pipe and which acts as the conveyor.

C. Jacking pit shall mean the pit in which the jacking equipment is installed and from which both the casing pipe and carrier pipe are launched. Receiving pit shall mean the pit at the point where the carrier pipe emerges from the casing pipe.

1.06 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).

1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

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3. ASTM A139 - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4-in and over).

4. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

5. ASTM C150 - Standard Specification for Portland Cement.

6. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

B. American Railway Engineering and Maintenance of Right-of-Way Association (AREMA)

1. AREMA Manual for Railroad Engineering, Volume 1: Track Chapter 1, Roadway and Ballast.

C. American Welding Society (AWS)

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

1.07 PROTECTION

A. All existing facilities which include but are not limited to structures, buildings, utilities, posts, pavements, sidewalks, landscaping, fencing, and other improvements shall be adequately protected during construction. All on and off-site features damaged by the construction shall be replaced with materials fully identical to, and including but not necessarily limited to, the same type, dimension, size, species and conditions before damage to the satisfaction of the Owner.

B. Design, furnish, install, monitor and maintain excavation support for pits as required and as specified in Section 02311.

C. Furnish, install, monitor and maintain dewatering and drainage systems as required and as specified in Section 02140.

D. Furnish, install, monitor and maintain settlement monitoring points and other geotechnical instrumentations as specified herein and Section 02495 to complete the work shown on the Drawings and specified herein.

1.08 DELIVERY, STORAGE AND HANDLING

A. All pipe shall be subjected to a careful inspection prior to being installed. If any pipe fails to meet the specified requirements, it shall be removed and replaced with satisfactory pipe.

B. Deliver, unload, and store materials at the site with a minimum of handling. Do not drop or store materials directly on the ground.

C. Handle materials so they are delivered to the jacking pit in sound, undamaged condition. Pipe shall be carried to the jacking pit, not dragged.

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1.09 PROJECT/SITE REQUIREMENTS

A. Discharge from dewatering operations shall be treated and discharged as specified in Section 02140.

B. Inspect the locations where jacking operations will be conducted and the pipe is to be installed, verify the conditions under which the work will be performed, and provide all items required for the orderly prosecution of the work. Protect all existing facilities within the area.

C. Jacking operations shall not result in settlement in excess of the limits specified herein. If any movement or settlement occurs which causes or might cause damage to streets, railroad tracks, utilities, or structures over, along, or adjacent to the work, jacking operations shall stop immediately except for those activities which will assist in making the work secure and prevent further movement, settlement, or damage. Jacking operations may resume only after all necessary precautions have been taken to prevent further movement, settlement, or damage.

D. Streets, utilities, railroad tracks and structures damaged by jacking operations shall be repaired or replaced as necessary to restore them to their condition prior to beginning jacking operations by the Contractor at no additional cost to the Owner.

1.10 CASING TOLERANCES

A. Casing Tolerances

1. Proper alignment and elevation of the casing shall be consistently maintained throughout the jacking operation. Tolerances for installation of the casing pipes from the design lines and grade shall be as follows:

   a. Vertical - plus or minus 0.50 foot
   b. Horizontal - plus or minus 0.50 foot

2. When the jacked casing pipe deviates from design line or grade by amount greater than that specified, the pipe shall be returned to design line or grade plus or minus the specified tolerance at a rate of not more than 1-in per 25-ft.

3. If the jacked casing pipe is off design line or grade by an amount that requires redesign of the pipeline or associated structures, the Contractor shall do so at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. The <u>minimum</u> casing size shall be 48-inches and thickness shall be 0.688-inches.

B. Casing pipe size as shown on the Contract Drawings may be modified with approval of the Engineer and at no additional cost or delay to the Owner.

C. Steel casing pipe shall have minimum yield strength of 35,000 psi and be equipped with grout holes as specified herein. The casing pipe shall be designed to withstand the dead load of earth and railroad live load. The dead load of earth shall be considered 120 pounds per cubic feet.

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Railroad live load shall be Cooper E-80 with 50% added for impact. The casing pipe shall conform to ASTM A53.

D. Steel pipe casing shall be furnished in lengths of the Contractor's choice. The casing shall have beveled ends with a single or double v-groove and shall be field joined by full-penetration butt welding all around prior to jacking.

E. Steel casing pipe shall have 2-in grout holes at 4.5-ft-maximum intervals along the length of the pipe circumferentially placed at 120 degrees on centers (three holes at each interval) orientated with one hole at the crown. Two-inch steel pipe half-couplings shall be welded over the holes in the pipe and shall have threaded steel plugs. Holes shall be used for lubricant injections.

G. The jacking shield shall be of steel construction, designed to support all applicable surcharge loading as specified in the Contract Documents in addition to other loadings imposed. The advancing face shall be provided with a hood, extending no less than 24-in beyond the face and extending around no less than 240 degrees of the total circumference. The shield shall conform to and not exceed the outside dimension of the casing pipe being placed by more than 1-in at any point on the periphery unless approved by the Engineer. The shield shall be an open face shield with the appropriate configuration to allow for the installation of louvered doors or breasting system. The breasting system should be removable and replaceable in the event that obstructions are encountered.

H. A shield with appropriate configuration to allow for the installation of louvered doors or breasting system shall be employed to control the loss of face. The doors or breasting system shall be readily removable and replaceable to facilitate the removal of rock, stumps, and buried materials that impede the progress or direction of the casing.

I. Casing spacers, if required, shall be provided by Pipeline Seal and Insulator, Inc. (P.S.I.) of Gardena CA, or approved equal.

J. Bulkheads shall be provided to seal the space between the carrier pipe and casing pipe at each end of the casing pipe for grout containment. Bulkheads may be of masonry (minimum 8-in thick).

K. Grout for pressure injection between the casing and the earth shall be a mixture of Portland cement and bentonite or similar commercial product that shall harden to a minimum compressive strength of 500 psi. The grout shall be readily pumpable. The shop drawings shall include both the proposed grout and the pumping system.

L. Cement grout used to fill the space between the casing and the carrier pipes shall consist of a mixture of about 1 part cement to 6 parts sand which shall be subject to increase or decrease in the amount of cement necessary, as determined by the Engineer, to provide good flowing characteristics. Cement grout shall have a minimum pH of 12 and shall be free of fly ash.

M. Lubricant for decreasing jacking friction between the jacked casing pipe and earth shall be bentonite slurry or similar commercial product.

2.02 MONITORING POINTS

A. Establish system of control points and monitor in accordance with the requirements of Section 02495.

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PART 3 EXECUTION

3.01 PREPARATION

A. Survey and layout the jacking and receiving pit in accordance with approved drawings.

B. Pit locations as shown on the Contract Drawings may be modified with approval of the Engineer.

C. Excavate jacking pit and provide excavation supports as required for support of the pit. Refer to Section 02311 for excavation support requirements.

D. Jacking pit subgrades shall be kept free from ground and surface waters during jacking operations. Dewatering plan shall be in accordance with Section 02140. Additional groundwater controls may be ordered by the Engineer on short notice and shall be implemented as directed. Groundwater shall be maintained below the bottom of the jacking pit. Refer to Section 02140 for dewatering requirements.

E. Survey and layout the centerline locations of each of the casing pipe in accordance with the approved drawings

3.02 JACKING AND RECEIVING PITS

A. Furnish, install and later remove thrust blocks or such other provisions as may be required in driving the pipe forward.

B. Trench boxes shall not be used as support of excavation for any jacking pits.

C. Furnish a level concrete slab at the bottom of the jacking pit. 6-in thick minimum concrete working mat shall be provided in all jacking pits.

D. Steel rails or beams embedded in the concrete slab shall be used in the jacking pit for placement and alignment of each piece of casing pipe during installation operations.

3.03 JACKING OPERATIONS

A. Casing pipes under existing railroads where so shown shall be installed to the limits shown in accordance with the approved encroachment agreement or permit.

B. The Contractor shall provide all material, equipment, and facilities required for installing, positioning, and jacking the casing pipe.

C. The casing pipe at each location shown on the Drawings shall be jacked in one continuous, 24-hour-per-day 7-days-per-week, operation. In no event shall jacking or lubricant injection be discontinued for sufficient period to cause the partially jacked sleeve to "freeze" in place.

D. Jacking shall not commence until the Contractor’s surveyor has verified in writing to the Engineer that the first pipe casing segment is at the correct location and elevation and is oriented at the correct horizontal and vertical direction. After the first segment has been jacked forward, the Contractor’s surveyor shall again verify in writing to the Engineer that alignment is within

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tolerance. If alignment is not correct at this point, or any successive point, the jacked casing operation shall be stopped and shall not resume until the Contractor has modified the jacking operation as required to maintain proper alignment at no additional cost to the Owner.

E. Establish survey station marks over the entire length of the jacked casing during jacking operations at intervals of not more than 25 feet and to an accuracy of 0.01 foot. The alignment of the casing pipe shall be checked at least daily by the Contractor's surveyor as the casing progresses and daily written reports provided to the Engineer. Adjustments shall be made immediately if any misalignment occurs.

F. Jacking shall not commence until the Contractor has installed, initialized, and is prepared to record readings from all geotechnical instrumentation as required herein.

G. The Contractor shall be fully responsible for minimizing the occurrence of voids outside the casing pipe. All voids shall be filled with cement grout.

H. The Contractor shall excavate only within the limits of the shield to minimize the volume of the voids outside the jacked casing pipe and shall constantly exercise care in the removal of the excavation.

I. Groundwater shall be controlled at all times in accordance with Section 02140. If groundwater is expected to be above or within the casing level, a groundwater control system consisting of vertical or horizontal wells or well points shall be installed and operated such that the groundwater level is lowered to at least 2-ft below the casing invert level at the face.

J. The Contractor shall use a jacking ring consisting of either steel or concrete construction. This jacking ring will allow the jacking pressure to be distributed evenly around the wall of the casing pipe.

K. The Contractor shall also use a jacking frame. The frame shall be fabricated from structural steel members and shall be designed to distribute the stresses from the jacks evenly to the jacking ring.

L. The Contractor shall use thrust blocks adequately designed to carry the thrust of the jacks to the soil without excessive soil deflection and in such a manner as to avoid any disturbance of adjacent structures or utilities and to jack the casing reliably in the correct alignment.

M. Jacking pressures used shall be uniformly distributed through the jacking frame and parallel to the axis of the pipe. Extreme care shall be taken so that crushing or other damage to the joints of the casing pipe will not occur.

N. The Contractor shall have a redundant lubricant injection system connected for immediate use in the event the primary system fails during the jacking operation. Lubricant injection shall be continuous until the casing is fully installed.

O. If work is stopped for any reason, the exposed face of the excavation shall be fully protected with a bulkhead satisfactory to the Engineer.

P. The carrier pipe shall not be direct jacked.

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Q. The carrier pipe shall not be installed until leakage into the casing pipe, after removal of all dewatering pumping systems, does not exceed 20 gallons per hour/100 linear feet of finished casing pipe.

R. The Contractor shall be responsible for damages resulting from subsidence, collapsed casings, or ground losses into the jacked pipe casing and for the refilling of voids resulting there from with grout. Where such ground losses are so severe that they result in damage to underground or surface pavement, existing utilities or structures, the Contractor shall be solely responsible for remedying such damage. Where the filling of voids cannot be effectively carried out from below, the Engineer reserves the right to order the Contractor, at no additional cost to the Owner, to make openings from the surface for the purpose of backfilling the voids. If in the judgment of the Engineer, a portion of the casing and/or pipe requires reinforcing because of such collapse, the Engineer may direct the Contractor to furnish and place such reinforcement at no additional cost to the Owner. Reinforcement may also be directed when the stability of the soil adjacent to the casing and/or pipe has been affected by the loss of ground.

S. The Contractor shall be responsible for all effects on railroad traffic resulting from such ground loss, including all costs and all coordination with and meeting traffic control requirements of MBTA/Pan Am Railways and the required traffic control, permit acquisition, fees, fines, etc.

T. Maximum allowable deflection of the inside diameter of the casing in any direction from a true circle shall be 1.0 percent of the inside diameter.

3.04 OBSTRUCTIONS DURING JACKING

A. The Contractor shall anticipate the presence of obstructions including boulders, cobbles and fill materials and provide methods capable of breaking/removing the obstructions.

B. The Contractor shall notify the Engineer immediately upon encountering an obstruction which stops forward progress of the Work.

C. Any voids due to over-breakage of obstruction outside of the outside diameter of the jacked pipe shall be filled by injection or placement of concrete or other suitable substance to the satisfaction of the Engineer.

3.05 GROUTING

A. Immediately following the jacking operation, pressure grout the jacked section to fill all voids existing outside of the casing pipe. Grouting shall be performed from the interior of the casing pipe through grouting holes. Lubricant shall be displaced by the grout. Grouting shall be started in the lowest connections and shall proceed until grout begins to flow from upper connections. The void shall be completely filled. Displaced lubricant shall be disposed of off-site in accordance with applicable regulations and codes of all Federal, State, and local agencies.

B. Grout pressure shall not exceed one-half of the existing overburden pressure.

C. Apparatus for mixing and placing grout shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.

D. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable devices until the grout has set sufficiently in the judgment of the Engineer, or for a minimum of

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24 hours, whichever is longer. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

3.06 CARRIER PIPELINE INSTALLATION IN CASING AND FILLING OF ANNULAR SPACE

A. After casing installation is complete and found acceptable by the Engineer, the Contractor shall prepare for installation of the carrier pipes in the casing either by skid riser and runner as shown on the Contract Drawing or by placing rails embedded in concrete in the invert to the specified grade of the pipeline. If necessary, for pushing or pulling carrier pipes through the casing pipe, two steel channel rails of suitable size and shape shall be positioned accurately by a welded steel support system and then partially embedded in the concrete to support the pipe. Rails shall have top flanges at least 1.5-in wide and shall weigh at least 5.0 pounds per foot. Rails shall be lubricated to minimize sliding friction. The rails shall in no way be connected to or touching the casing pipe.

B. The pipes shall be supported securely on wood or steel cribbing in such a manner that the pipe is supported on each end by the cribbing, and if rails are used, does not slide directly on the rails. The cribbing shall remain in place and shall be securely fastened to the pipe by steel cables or banding. Each segment of pipe shall be pulled or winched through the casing supported on the cribbing which shall slide along until it mates with the previously installed pipe segment. Mortar skids (12-in wide) fabricated on RCP are also allowed. Under no conditions will pipe transport equipment that places any load on the interior of the preceding pipe section be allowed nor will sliding the pipe directly on the rails be allowed.

C. Each pipe segment shall be blocked against the casing on the top and both sides to prevent displacement during grouting. Use CCA treated wood for blocking. Adjust the elevation and alignment of each pipe with wood shims, if necessary, before blocking. Carrier pipe shall be installed to the lines and grades shown on the Contract Drawings.

D. Acceptable alternatives to the system described in paragraphs A, B, and C shall be casing spacers designed and certified by P.S.I., or an approved equal, as capable of withstanding the forces to pull the pipe sections into the casing and to support the full weight of the pipe. The casing spacers shall prevent any movement or displacement of the pipe during grouting.

E. Each carrier pipe shall be tested per the requirements of the relevant pipe specification. The testing must be performed and accepted by the Engineer prior to grouting the annulus between the carrier pipe and the casing pipe. There shall be no exceptions to this requirement. No pipe will be paid for until it has been successfully tested.

F. After the carrier pipe has been installed in the casing, shimmed, blocked, and tested, seal the ends of the casing around the pipeline with bulkheads and completely fill the space between the casing and the pipeline with cement grout. Cement grout shall be pumped through 2-in-minimum unjointed HDPE pipes extending through one bulkhead into the top of the casing at maximum 40-ft intervals. One pipe shall be located so as to be within 10-ft of the opposite bulkhead. This operation shall be performed in at least two stages to help prevent flotation. To ensure that the casing is completely full, two 2-in-minimum unjointed HDPE pipes shall be installed near the crown of the casing from the midpoint of the casing to each end, and 2-in openings shall be provided in each bulkhead at the casing crown. Grout shall be pumped into the casing until it flows from the top of the casing in the HDPE pipe and bulkhead openings at both ends. Leave the HDPE pipe in place and cut off at the end of the casing.

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3.07 RESTORATION

A. All areas disturbed by construction shall be restored to existing condition and maintained until accepted by the Engineer and NYS&W.

B. At the conclusion of all jacking operations, and piping installation within the jacking pit, remove all systems used to, jack, grout, and lubricate.

C. Remove all dewatering systems in accordance with Section 02140.

D. Remove excavation support systems where allowed in accordance with Section 02311.

E. Following pipe installation and backfill operations, restore the profile of the right-of-way to its original condition. Construct sidewalk and fencing, if applicable, to match existing. Install pavement to match existing, as indicated on the Drawings and in the Specifications.

F. Remove all equipment, supplies, excess excavation materials and miscellaneous items associated with the jacking operation and leave the site in a clean condition.

G. Thrust block shall be removed unless approved by the Engineer.

3.08 EXCAVATED MATERIALS

A. Dispose of all excavated materials not required for the restoration of the site and backfilling of in accordance with the requirements of Section 02221.

END OF SECTION

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SECTION 02450

WORK IN OR NEAR RAILROAD PROPERTY

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials and incidentals required and install the new sewer pipes in the locations as shown on the Drawings and as specified herein. As shown on the Drawings some of the new sewer system is to be installed within the right-of-way of the Massachusetts Bay Area Transportation Authority, which is operated by Pan-Am Railways.

B. The Owner has obtained permanent and temporary construction easements for Contractor's entry onto the property. The draft MBTA License is included in Appendix I. The Owner has received approval of the design plan from Pan Am Railways.

C. The Contractor shall submit payment of the license fee of $2,822.35 on behalf of the City and the contractor's certificate of insurances to the MBTA, as part of the lump sum fee for the pipe jacking in this contract, to obtain the final license agreement from MBTA. The Contractor will not have to enter into any additional contractual obligations with the railroad for easements to perform the work as shown on the drawings.

1.02 OPERATIONS ON RAILROAD PROPERTY

A. All work on this project affecting Pan-Am Railway's property, right-of-way, or facilities shall be carried out to the full satisfaction of the Chief Engineering Officer, or his/her authorized representative. Review all requirements Pan-Am Railways as it pertains to the specific project work accordingly.

B. Access to the site will not be permitted without an access agreement to be provided by the Owner. This access agreement does not relieve the Contractor from any additional project requirements specified below.

C. Prior to the start of work, furnish, at no expense to Railroad, copies of insurance to the MBTA and Pan-Am Railways Chief Engineering Officer and Owner.

D. The policies shall be in force before any work is done in the vicinity of the Railroad and shall remain in effect until all work required to be performed under the terms of the Contract is satisfactorily completed as evidenced by the formal acceptance.

E. Insurance shall be provided with the MBTA Railroad as specified in Appendix K, Section III, titled "Insurance Specifications".

F. Insurance shall be provided with Pan Am Railways as specified in Appendix J, Section III titled "Standard Railroad Specifications", Item 8 on pages 19-20. Insurance Item E "Hazardous Materials Insurance" shall be excluded from the insurance requirements.

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G. The Railroad and the Owner are to be furnished a copy of the General Liability Policies at least 7 days prior to commencement of the work or the location of any equipment on Railroad property.

H. No changes or alterations in the policies shall be made without the Railroad approval. All policies must contain a minimum 30-day written notice of cancellation clause.

I. An advance deposit to the Railroad is required. Prior to the start of any work on the railroad right-of-way, consult with the Railroad for review of the operators by the Chief Engineer. Upon completion of this review, the Railroad will advise of the deposit required. If the Railroad expenses are greater than the amount of the deposit, reimburse the Railroad for the balance when billed and if the Railroad expenses are less than the amount of the deposit, the Railroad will refund the balance. The Railroad will provide, at its sole discretion, such personnel as it deems necessary or advisable because of the project. All work and/or services performed by the Railroad shall be paid for by the Contractor. The Railroad reserves the right to request additional deposits as project work progresses.

J. Prior to the start of work, an outline of the methods to be used for construction and a time schedule for operations shall be submitted to the Railroad and the Engineer for approval and no work shall be done until approval is given by the Railroad.

K. Provide 7 days written notice prior to start of the actual work. The notice shall be given to the Railroad and a copy to the Engineer.

L. Conduct the work so that schedules, trains and speeds can be maintained on the Railroad at all times. The safety and continuous operation of the Railroad is of primary importance and shall be safeguarded at all times.

M. Install, maintain and remove any sheeting, underpinning, cribbing, etc, to support any structure or facility on the right-of-way owned by Pan-Am Railways. The Railroad or the Engineer, depending upon existing conditions, may require that sheeting for the drain trench be left in place.

N. In no instance shall any wires, equipment or other appurtenances be placed across or pass across Railroad property without the express written permission of the Chief Engineering Officer.

O. Railroad inspection of the work shall be permitted at all times and full cooperation with Railroad representatives will be required.

P. All equipment used on Railroad property may be inspected by the Railroad and shall not be used if considered unsatisfactory by Railroad representatives. Operators of such equipment may be examined by Railroad representatives to determine their fitness. The Railroad tracks shall be kept free of obstructions at all times.

Q. No blasting will be permitted under or adjacent to the tracks with approval from the Railroad.

R. No claims for any delays in completion time due to Railroad causes if the requirements set forth in this specification are not complied with immediately by the Contractor.

S. Be fully responsible for all damages arising from the failure to comply with the regulations and the requirements of this Section.

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T. All work within the railroad right-of-way shall be performed and completed in a manner fully satisfactory to the Railroad's Chief Engineering Officer or his/her authorized representative.

END OF SECTION

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SECTION 02495

GEOTECHNICAL INSTRUMENTATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all material, equipment, labor and services required for the complete installation, maintenance, protection, and monitoring of geotechnical instrumentations and reporting of collected data for all instrumentation as specified in this section and as necessary to monitor construction performance and impacts within and around all excavations, rock removal, and trenchless crossings. The work includes, but is not limited to: furnishing, installing, monitoring, and reporting vibration monitoring data to the Engineer; furnishing, installing, monitoring by survey, reducing, plotting, reporting the survey data to the engineer and maintaining and protecting all the instrumentation on buildings, utilities, and in the ground adjacent to the site or on the site as specified in this Section and as necessary to monitor construction performance and impacts on adjacent property.

B. Conduct pre-construction survey as specified herein.

C. Coordinate and obtain all permissions required, both public and private, to install geotechnical instrumentation.

D. The instruments installed by the Contractor shall be installed under the observation of the Engineer.

E. Establish response actions to be taken if the maximum allowable instrument readings are exceeded so that existing structures and utilities are protected from damage. Implement response actions if maximum allowable instrument readings are exceeded.

F. Dispose of all instruments at the end of the project as instructed by the Engineer.

1.02 RELATED WORK

A. Dewatering and Drainage is included in Section 02140.

B. Rock and boulder excavation is included in Section 02213.

C. Earthwork is included in Section 02221.

D. Support of Excavation is included in Section 02311.

E. Pipe Jacking is included in Section 02340.

F. Work In Or Near Railroad Property is included in Section 02450.

1.03 PURPOSE OF THE GEOTECHNCIAL INSTRUMENTATION PROGRAM

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A. The purpose of the geotechnical instrumentation is to monitor:
   1. Performance of the Contractor's excavation support system.
   2. Performance of the Contractor's pipe jacking work.
   3. Groundwater levels inside and outside the limits of the excavation.
   4. Vertical deformation of ground surface and railroads adjacent to the work.
   5. Vertical and horizontal deformation of existing utilities and structures adjacent to the work.
   6. Ground vibration levels at adjacent facilities due to Contractor activities.

1.04 RESPONSIBILITIES OF CONTRACTOR

A. Prior to commencing any excavation, both open trench and pipe jacking, and dewatering work, furnish components of instrumentation that are to be installed during construction and conduct pre-construction surveys.

B. Install instruments.

C. Protect from damage and maintain instruments installed by the Contractor.

D. Repair or replace damaged instruments furnished by the Contractor.

E. Collect, reduce, process, plot and report settlement-monitoring data obtained by survey, seismograph data, groundwater levels, and submit to the Engineer.

F. Coordinate with the Engineer to verify consistency of collected data.

G. Implement remedial measures based on interpretations of monitoring data program.

1.05 SUBMITTALS

A. Submit in accordance with the provisions set forth in Section 01300 for review by the Engineer the following information two weeks prior to instrument installation:

   1. Installation Plan and Schedule: Full details of the proposed plan and schedule for installing and monitoring instruments, including proposed locations, types, and installation methods of the instruments, monitoring schedule.

   2. The names, qualifications, and experience of the personnel or subcontractor(s) who will install the instruments, perform optical level survey, read the instruments, and report data to the Engineer demonstrating compliance with Paragraph 1.07 herein.

   3. Copies of all instrument calibrations and certifications specified.

   4. Description of methods for installing and protecting all instrumentation including but not limited to seismographs, observation wells, settlement monitoring points, and reference points.

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5. Layout of settlement monitoring points and reference points and description of monitoring provisions.

6. Groundwater observation well construction details including casing type, filter gradation, screen interval, grout mix, drilling methods, and depth of wells.

7. For all instrumentation installed in borings provide a detailed procedure for installation, including post-installation acceptance test, together with a sample installation record sheet. The installation procedures shall include:
    a. The method to be used for cleaning the inside of casing or augers.
    b. Proposed grout mixes.
    c. Drill casing or auger type and size.
    d. Depth increments for backfilling boreholes with sand and bentonite.
    e. Method for overcoming buoyancy of instrumentation components during grouting.
    f. Method of sealing joints in pipe casing to prevent ingress of grout.
    g. Installations Records: Within five days of installing each instrument, the Contractor shall submit to the Engineer, the as-built instrument location as specified, and its corresponding installation record sheet. The installation record sheet shall include, but not be limited to, the installed location of each instrument with instrument identification numbers, established elevations, initial elevations, initial coordinates, boring log, installation and/or monitoring date and time. The Contractor shall also furnish details of installed instruments showing all dimensions and materials used, and as-built drawings of each instrument.

8. Field Calibration: Within 5 working days of performing a field calibration, submit results of the calibration to the Engineer.

9. Reports and Records: Provide reports of monitoring data to the Engineer.

10. Certificates: For each seismograph instrument to be furnished submit a certificate issued by the instrument's manufacturer stating that the manufacturer has inspected and tested each instrument before it leaves the factory to see that the instrument is working correctly and has no defects or missing parts.

11. Submit three copies of the pre-construction condition surveys as specified herein.

B. Submit proposed remedial measures to the Engineer of action to be taken in the event that the instrument Threshold Values are reached.

1.06 DEFINITIONS

A. Surface Monitoring Points (SMPs): Inscribed marking or approved surveyor's nail installed to measure vertical (elevation) movement.

B. Deformation Monitoring Points (DMPs): Fixed markers placed on existing utilities and structures to measure both vertical and horizontal movement. Initial coordinate locations and vertical controls are determined by optical survey methods.

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C. Excavation Support Monitoring Points (ESMPs): Inscribed marking or fixed makers placed on excavation support systems to measure horizontal movement of the excavation support system.

D. Groundwater Observation Wells: Screened or slotted pipe with solid riser pipe installed in a drilled hole with the annulus around the pipe backfilled with sand. Near surface groundwater levels are measured in the well.

E. Seismographs: Electronic recording device with vibration transducer capable of monitoring and recording ground vibrations induced by construction activity.

1.07 QUALITY ASSURANCE

A. Personnel Qualifications for Instrument Installation:

1. Employ qualified technicians with comparable experience in the installation of geotechnical instrumentation similar to that specified herein.

2. Employ a professional engineer or engineering geologist, with specialized experience in the installation of instrumentation specified herein, to supervise and direct technicians and be responsible for instrument installation. This person is to be present at the installation site(s) to direct and supervise the installations.

B. Installation of instrumentation shall, at all times, be performed in the presence of the Engineer.

C. The Contractor shall be responsible for all aspects pertaining to the installation, maintenance and monitoring of the geotechnical instrumentation specified herein.

D. Each instrument or component of instrument specified herein shall be the product of an acceptable manufacturer currently engaged in manufacturing geotechnical instrumentation hardware of the specified types.

E. Surveyor Qualifications: The Contractor’s professional Land Surveyors shall be registered in the Commonwealth of Massachusetts and with at least three years of experience in surveying of similar instruments. The professional Land Surveyors shall establish the Deformation Monitoring Points and take baseline readings.

F. The Contractor shall perform optical level surveys, instrument readings, and report data. Personnel responsible for this work shall be qualified by a minimum of three years of experience with similar work.

G. Factory Calibration: A factory calibration shall be conducted on all seismographs prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the U.S. National Institute of Standards and Technology.

H. Vibration monitoring shall be conducted by persons 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.

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I. Persons responsible for pre-construction surveys shall be professional engineers, licensed in the State of Michigan, and shall have had a minimum of 5 years of professional experience in structural evaluation and conditions surveys.

1.08 TOLERANCES

A. Survey measurements for initial location of each of the instrumentation elements shall consist of determining the elevation and horizontal position with respect to benchmark(s) approved by the Engineer.

B. Settlement Monitoring Point (SMPs, DMPs and ESMPs)

1. Elevations of all instrumentation shall be determined to an accuracy of plus/minus 0.01 feet.

2. The horizontal position of surface monitoring points shall be determined to an accuracy of plus/minus 0.1 foot.

3. The horizontal position of deformation monitoring points shall be determined to an accuracy of plus/minus 0.01 foot.

C. Should actual field conditions prohibit installation at the location and elevations specified in this Section, obtain prior acceptance from the Engineer for new instrument location and elevation.

1.09 DESIGN AND PROJECT REQUIREMENTS

A. Project Requirements

1. The Contractor shall install Geotechnical Instrumentation as required herein and as necessary to monitor ground conditions, ground response, and facilities to achieve specified project requirements, and prevent damage to facilities potentially affected.

2. The Contractor shall install the instrumentation in accordance with an approved Instrumentation Schedule.

3. The Engineer's monitoring of the installed instruments does not relieve the Contractor of his obligation to complete the project within the requirements specified herein and the Contractor shall take additional measurements as may be necessary.

B. Pre-Construction Survey

1. Prior to start of excavation, installation of excavation support, rock excavation, dewatering and pipe jacking, engage the services of an independent professional engineer, licensed in the Commonwealth of Massachusetts, to conduct a pre-construction survey of existing structures and conditions within 100-ft of the alignment.

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a. Coordinate activities, issue notices, obtain clearances and provide photographic and secretarial assistance necessary to accomplish the survey.

b. Give notice in writing, to the property owner and any representative of local authorities required to be present at such survey. Notify in writing the dates on which surveys are planned so that representatives are present during the examination. Provide copies of notices to the Owner and Engineer.

2. Observations shall be recorded of the existing conditions for residences, buildings and other structures, which might be affected.

a. The survey shall consist of a description of interior and exterior conditions. Descriptions shall locate cracks, damage or other defects existing and shall include information to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exists, or for defects too complicated to describe in words, photographs shall be taken and made part of the record.

b. The records of each property examined shall be signed by the representatives present and, if practicable, by the property owner, whether or not they are present at the examinations.

3. Contractor's record of the pre-construction survey shall consist of written documentation, video and photographs of the conditions identified. At the completion of the survey, submit copies of the documentation to the Owner.

4. Upon completion of all excavation work, installation of excavation support, dewatering, pipe jacking and backfilling, the Contractor shall make a similar examination of properties and structures where complaints of damage have been received or damage claims have been filed. Give notice to interested parties so that they may be present during the final examinations. Records of the final examination shall be signed and distributed as the original pre-construction survey.

5. The records so obtained shall be retained in the Contractor's file for at least three years after completion of the Contract. In the event of damage claims, a report shall be prepared by the Contractor on the particular structures as requested by the Engineer from those notes and photographs and submitted to the Owner. Damage attributed to the Contractor's activity shall be repaired promptly and completely to the property owner's satisfaction to restore the conditions of the property to that existing prior to work.

C. Secure all required permits prior to the installation or removal of observation wells.

D. Provide and facilitate safe access to the instruments at all times. The Engineer may perform additional monitoring in a manner that will minimize unnecessary work delays. The Contractor shall allow and facilitate instrument monitoring as required by the Engineer. No claim for lost production time due to this activity will be allowed.

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E. Contractor shall maintain all instrumentation. Contractor shall replace all damaged instruments within 24 hours. Report all damaged or non-functional instrumentation to the Engineer within 24 hours.

F. Availability of Data

1. Interpretations developed by Engineer will be available to Contractor. Contractor may observe readings at any time or take his/her own supplementary readings.

2. Monitoring data shall be the property of the Owner and are not to be disclosed to third parties or published without permission of the Owner.

3. Contractor is expected to make his/her own interpretations for his/her own purposes at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: All instruments and materials, including readout units, shall remain the property of the Contractor following completion of the Contract.

B. The minimum quantity of instruments to be furnished by the Contractor is as follows:

Instrument	Minimum No. of Units	Approximate Installed Depth
Seismographs	2	N/A
Groundwater Observation Wells	3	10 ft. below bottom of excavation
Surface Monitoring Points	70	N/A
Deformation Monitoring Points	20	N/A
Excavation Support Monitoring Points	As needed	N/A

C. Locations of instruments shall be determined by the Contractor and approved by the Engineer.

2.02 GROUNDWATER OBSERVATION WELLS

A. Observation wells will be used to monitor the groundwater levels outside the excavation and trenchless pipe installation.

B. Pipe shall consist of 1-inch minimum inside diameter Schedule 40 PVC pipe.

C. Maximum screen size shall be 0.020-in unless otherwise approved by the Engineer.

2.03 MONITORING POINTS

A. Establish system of control points and monitor in accordance with the requirements herein.

1. Deformation Monitoring Points (DMPs)

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a. DMP's will be used to monitor vertical and horizontal movement of adjacent utilities and structures.

b. DMP's shall consist of nails, screws, reinforcing bars, bolts and similar materials with well-defined measurement points as approved by the Engineer. DMP's shall be firmly attached and shall be protected from damage and vandalism. Remove or cover with a protective box or cap as approved by the Engineer all elements of DMP's protruding more than 0.25-in. Clearly identified all DMP's with permanent easily readable letters and numbers as approved by the Engineer.

c. DMP for utility shall consist of Schedule 40 PVC casing installed to top of utility to be monitored by vacuum excavation method and a monitoring rod with centralizers set on top of the utility and extending to within 1 foot of the ground surface, or equivalent. The utility monitoring point shall be installed with a flushmount roadbox casing at grade and shall be clearly identified by surface marking

2. Surface Monitoring Points (SMPs)

a. SMP's will be used to monitor vertical deformation at or near the ground surface. Clearly identified all points with permanent easily readable letters and numbers as approved by the Engineer.

b. SMP in paved areas shall consist of a 2 inch long masonry nail. The nail shall be manufactured from hardened zinc – plated steel. The masonry nail shall be driven into an asphalt covered surface. Each nail shall be individually identified by an identification tag or surface marking.

c. SMP in non-paved areas shall consist of a 3 ft. long, ¾ inch diameter steel rod. The rod shall be driven into the ground or set in concrete in the ground such that no more than 3 inches of the rod is exposed above the ground surface. The top of the rod shall be rounded and punchmarked at its center. Each rod shall be individually identified by a surface marking.

d. SMP on utility manholes shall consist of an observable cross mark or welded bead on the top horizontal surface of utility manhole rims. The surface within 3 inches of the point shall be cleaned and / or marked to permit easy identification of the exact point. The point shall also be clearly identified using fluorescent spray paint adjacent to the point.

3. Excavation Support Monitoring Points (ESMPs)

a. ESMPs shall be fixed markers on the vertical elements of the excavation support system and shall be used to monitor horizontal deformation of excavation support system designed by the Contractor. Clearly identified all points with permanent easily readable letters and numbers as approved by the Engineer.

B. Non-Shrink Cement Grout - Suitable for intended application.

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2.04 SEISMOGRAPHS

A. Provide portable seismographs and monitor the velocities of ground vibrations resulting from construction activities when necessary. Provide for full-time use on the project during installation of sheeting or other vibration causing construction activities. Provide two (minimum) seismographs which have been calibrated within the previous six months to a standard that is traceable to the National Bureau of Standards. Required characteristics of seismographs are listed below:

1. Measure the three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.

2. Measure and display the maximum peak particle velocity.

3. Have a flat velocity frequency response with a minimum broad band of 6 Hz to 150 Hz with a tolerance equal to or better than plus or minus 10 percent.

4. Self-triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, peak overpressure, frequencies of peaks.

5. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of 1 minute or less.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform a pre-construction survey prior to any dewatering, excavation, pipe jacking or installation of excavation support.

B. Install instruments at locations selected by the Contractor and approved by the Engineer in accordance with the approved installation procedures. The Engineer may modify instrument locations depending on field conditions and monitoring objectives. Install all instrumentation in accordance with the approved installation schedule. Instruments shall be installed and baseline data, acceptable to the Engineer, obtained before construction starts.

C. Provide the Engineer with access to instrument locations and assistance required in obtaining monitoring data.

D. Existing Conditions: Locate conduits and underground utilities in all areas where wells are to be drilled and installed. Call utility companies prior to any drilling. Instrument locations shall be modified, as approved by the Engineer, to avoid interference with the existing conduits and utilities. Repair damage to existing utilities resulting from instrument installations at no additional cost to the Owner.

E. All instruments shall be clearly marked, labeled, and protected to avoid being obstructed or otherwise damaged by construction operations or the general public. Immediately following installation, the location of the top of all instruments shall be surveyed to provide horizontal and

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vertical coordinates. Resurveying shall be done as required by the Engineer if there is a question regarding the instrumentation location.

F. A unique instrument identification number shall be assigned to each instrument and each point. The instrument identification number shall be clearly marked on each instrument in a non-destructible manner.

G. Drilling from the Ground Surface: Obtain necessary permits for each such instrument and conform to the permit requirements during drilling and installation.

H. Initial Reading: Immediately following instrument installation, the Contractor, in the presence of the Engineer, shall take two sets of initial readings to provide baseline readings and to demonstrate the adequacy of the completed installation.

I. Factory Calibration: A factory calibration shall be conducted on all instruments at the manufacturer's facility prior to shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number.

J. The instrumentation and monitoring specified here is considered the minimum required. The Contractor shall obtain additional data from the instrumentation and /or furnish, install, and monitor additional instrumentation as necessary to adequately monitor construction performance and safety aspects of the work.

3.02 MONITORING POINTS

A. Monitoring Points shall include but not be limited to SMP, DMP and ESMPs. Monitor these control points using surveying methods.

B. Install SMPs and DMPs as described below at pipe jacking and open trench locations. Additional DMPs may be required by the Engineer.

C. In general, SMPs shall be installed on over the pipe jacking alignment above the centerline of the jacked casing in rows of three, oriented perpendicular to the pipe, with one row directly along the casing pipe centerline and two rows at 15 feet on each side. Monitoring points should be spaced at 10 feet on center along the pipe center line, with at least one set of point on each set of the railroad tracks or as close as permitted. Locations may be modified to meet site constraints with the approval of the Engineer.

D. SMPs shall be installed in the pavement or ground surface along each side of trench excavations and excavation for the structures at 10 ft from the excavations and at not more than 50 ft spacing. Locations may be modified to meet site constraints with the approval of the Engineer.

E. At least 6 SMPs shall be installed on the embankment of the Lowell Connector highway near the excavation, with at least 3 points on the embankment slope and at least 3 points on the roadway pavement.

F. SMPs shall also be installed on the rim of manhole covers of utilities located within 50 ft of pipe jacking alignment and trench excavations.

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G. DMPs:

1. DMP shall be installed on the exterior walls of buildings or structures located within 100 ft of pits, jacked pipe alignment or rock excavation and within 50 feet of open excavation area. As much as practical, DMPs shall be installed on supporting walls or columns. Avoid installation in brick unless absolutely necessary.

2. As a minimum, four DMPs shall be installed on the exterior wall corners of buildings, structures, or properties boundary walls at not more than 50 ft spacing. The Engineer may require additional DMPs be installed to monitor building movement at other locations.

3. DMP shall be installed on utility pipes/culverts within 20 feet of pipe jacking alignment and pit excavations.

4. Install DMPs in cooperation with property Owners so that installations are inconspicuous and acceptable to the property Owners. Existing features of building foundations that are permanent and can be repeatedly surveyed may substituted for DMPs, if approved by the Engineer.

H. Install and obtain settlement monitoring points readings prior to installing excavation support, beginning excavation, pipe jacking or operation of groundwater control system at the site. The Contractor shall obtain two sets of measurements for each SMP and DMP to establish the baseline data within three days of installation. These measurements shall be made at least 24 hours apart but not more than 48 hours apart. DMPs with initial surveyed elevations (or offsets as appropriate) differing by more than 2mm shall be check for secure installation and resurveyed.

I. The reading schedule of all SMPs and DMPs surveyed should be daily during excavation, excavation support installation, and pipe jacking within 100 ft of the work and then at least weekly until all excavation, dewatering and backfill has been completed. Additional surveys shall be made if excessive ground or building movement is noticed.

J. The survey measurements shall consist of determining the elevation and horizontal position of each of the Monitoring Points and other instrumentation elements with respect to benchmark(s) approved by the Engineer.

1. Elevations of all instrumentation shall be determined to an accuracy of plus/minus 0.01-ft.

2. The horizontal position of deformation monitoring points and all other monitoring points used within 50-ft of the structures shall be determined to an accuracy of plus/minus 0.01-ft.

3. The horizontal position of all instrumentation not otherwise specified shall be determined to an accuracy of 0.1-ft.

3.03 GROUNDWATER OBSERVATION WELLS

A. Existing wells may be used if appropriate and approved by the Engineer.

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B. The screened interval of each well shall be set to monitor ground water levels.

C. Using approved drilling methods, drill 4-in minimum diameter holes for observation wells of the size and depth required, and case with temporary casing. Bentonite drilling mud shall not be used in drilling holes for the observation wells.

D. Flush all cased holes with clean water through an approved bit. Flush until the discharge water is free of soil particles.

E. Construct observation well with 10-ft of slotted PVC well screen, filter sand, bentonite seal, couplings, a pipe cap, and a locking hole cover.

1. Place two feet of filter sand in the bottom of the drilled hole; then place the well screen and surround it with filter sand, as the temporary casing is carefully withdrawn.

2. Insert solid PVC casing and cap and fill the annular space with bentonite pellets then non-shrink cement grout.

3. Protect the observation wells at ground surface by providing a lockable box or outer protective casing with lockable top and padlock. Design the surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.

a. Provide two keys for each padlock to the Engineer for access to each well.

b. Observation wells shall be developed so as to provide a reliable indication of groundwater levels. Wells shall be re-developed if well clogging is observed, in the event of apparent erroneous readings, or as directed by the Engineer.

c. Submit observation well installation logs, top of casing elevation, and well locations to the Engineer within 24 hours of completion of well installation.

F. Observation Well Maintenance

1. The Contractor shall maintain each observation well until adjacent structures and pipelines are completed and backfilled. Clean out or replace any observation well which ceases to be operable before adjacent work is completed.

2. It is the Contractor's obligation to maintain observation wells and repair or replace them at no additional cost to the Owner, whether or not the observation wells are damaged by the Contractor's operations or by third parties.

G. Monitoring and Reporting of Observation Well Data

1. The Contractor shall begin daily monitoring of groundwater levels in work areas prior to initial operation of drainage and dewatering system. Daily monitoring in areas where groundwater control is in operation shall continue until the time that adjacent structures

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and pipelines are completed and backfilled and until the time that groundwater control systems are turned off.

2. The Contractor is responsible for processing and reporting observation well data to the Engineer on a daily basis. Data is to be provided to the Engineer on a form, which should include the following information: observation well number, depth to groundwater, top of casing elevation, groundwater level elevation and date and time of reading.

H. Following construction, abandon new observation wells as directed by the Engineer. Abandon observation wells by removing all material within the original borehole, including the casing, filter, and grout seal in accordance with local Department of Health Services permit. Using approved tremie methods completely fill the hole and all voids with non-shrink cement grout prior to removal of the drill casing such that formation materials do not move into the hole prior to grouting. Restore the ground surface to its original condition. Abandon wells within paved areas by removing the vaults and well caps to the pavement subgrade. Remove wells as discussed above and repair or patch pavement with the same surface type.

3.04 INSTRUMENT PROTECTION, MAINTENANCE AND REPAIR

A. Protect the instruments from damage. The Contractor shall immediately replace, within 72 hours of damage, any instrument that becomes damaged or is destroyed for whatever reason at no additional cost to the Owner. If necessary, the contractor will suspend work in the areas being monitored by the damaged instrument and take remedial action.

B. Maintain the instruments by draining water and flushing debris from under protective covers and keeping covers locked and sealed at all times.

3.05 MONITORING

A. The Contractor shall collect, tabulate, plot and interpret the survey monitoring data and provide the Engineer with the tabulated and plotted data. Report the status of excavation, bracing, groundwater levels, or pipe jacking operations and backfilling at the time of data collection with each report.

B. At a minimum, daily monitoring shall be required for all surface control points within 100 feet ahead of the tunnel heading and 100 feet behind the tunnel heading, and at least once per week until all subsidence stops. Monitoring frequency may be modified as directed and approved by the Engineer.

C. Provide data from readings of settlement monitoring points to the Engineer within 24 hours of reading. Communicate verbally with the Engineer immediately after visual observations or data collection if excessive movements or other anomalies are indicated. Provide initial support deformation monitoring data to the Engineer on a weekly basis.

D. Seismographs readings shall be taken during rock removal, support of excavation installation or other activities that cause ground vibrations to document that peak particle velocities do not exceed the limit criteria as described below.

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E. The Contractor shall make visual observations of ground conditions and building conditions in the vicinity of the site and communicate immediately with the Engineer if signs of ground or building movements are observed.

F. The Engineer may take independent instrumentation measurements. Cooperate with the Engineer during instrumentation monitoring by providing access to the instrumentation locations in a timely manner and by providing and maintaining safe means of access to all instrumentation locations for data collection. Data acquired by the Engineer will be made available to the Contractor in a timely manner.

G. The Contractor may make his/her own interpretations of monitoring data for his/her own purposes. Data or interpretations shall not be published of disclosed to other parties without advance written permission of the Owner.

3.06 INTERPRETATION AND RESPONSE VALUES

A. The Contractor shall make its own interpretations of the data resulting from monitoring programs.

B. Threshold and Limiting Values for instruments:

Instrument	Threshold Value	Limiting Value
Seismographs	0.5 in/sec	1.0 in/sec
Observation Wells:	1 ft. below excavation subgrade or jacked casing invert	at excavation subgrade or jacked casing invert.
Surface Monitoring Points	0.5 inch	1.0 inch
Deformation Monitoring Points	0.25 inch	0.5 inch

C. These values are subject to adjustment by the Engineer as indicated by prevailing conditions and/or circumstances.

D. If a Threshold Value is reached:

1. Engineer and Contractor shall meet to discuss remedial measures.

2. Contractor shall increase the instrument monitoring frequency as directed by the Engineer.

3. Contractor shall install and monitor additional instruments as directed.

4. Contractor shall implement the remedial measures in the event the Threshold Value is reached, so the Limiting Value is not reached.

E. Contractor to take all necessary steps so that the Limiting Value is not exceeded. Contractor may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid exceeding the Limiting Value.

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3.07 DISPOSITION OF INSTRUMENTS

A. Settlement Monitoring Points: All settlement monitoring points on public property shall be removed during the cleanup and restoration work, unless directed otherwise by the Engineer.

B. Observation Wells: When required by the Engineer, abandon and remove and casing, protective housings and caps in accordance with the required permits. All surfaces affected by installation of instruments shall be restored to their original condition prior to completion of work.

   1. Backfill remaining portions with non-shrink cement grout.

   2. Following backfilling, remove precast boxes or vaults and reconstruct pavement in paved areas. Restore surface to the conditions existing prior to installation of the instruments.

C. Seismographs: Units shall be returned to the Contractor following completion of the excavation.

END OF SECTION

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SECTION 02515

CONCRETE SIDEWALKS, WALKWAYS AND DRIVEWAY APRONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install concrete sidewalks, walkways and driveway aprons as specified herein.

B. Damaged concrete sidewalks, walkways and driveway aprons as a result of construction shall be replaced to the nearest existing undisturbed concrete panel on all sides of construction disturbance.

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Bituminous sidewalks, driveways and aprons are included in Section 02576.

C. Loaming and Seeding is included in Section 02930.

D. Concrete and Reinforcing Steel is included in Section 03301.

1.03 REFERENCE STANDARDS

A. Except as otherwise specified herein, the current Standard Specifications for Highways and Bridges, including all addenda, issued by the Commonwealth of Massachusetts, MassDOT (SSHB) shall apply to materials and workmanship required for the work of this Section.

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

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete shall be as specified in Section 03301, but in no case less than 4000 psi at 28 days.

B. Expansion joint filler shall be bituminous type, 1/2-in thick meeting AASHTO Spec. M-213-65.

C. Materials for gravel base course shall be as specified in Section 02230.

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PART 3 EXECUTION

3.01 SIDEWALK, WALKWAY AND DRIVEWAY APRON INSTALLATION

A. The full concrete sidewalk, walkway, or driveway apron panel(s) disturbed during construction shall be replaced. Contractor shall saw cut edges of existing concrete at the edge of the existing undisturbed panels. Existing panels shall be saw cut at an existing tooled joint or removed to an existing expansion joint. Contractor shall not saw cut existing concrete panels in the middle of an existing panel.

B. The subgrade for sidewalks, walkways and driveway aprons shall be shaped parallel to the proposed surface of the sidewalks, walkways and driveway aprons and thoroughly compacted. All depressions occurring shall be filled and again compacted until the surface is smooth and hard.

C. After the subgrade has been prepared, a crushed stone base course shall be placed. After being thoroughly compacted, the base course shall be at least 12-in in thickness and parallel to the proposed surface of the sidewalk, walkway or driveway apron. Reuse existing stone base in areas not disturbed for trenching and provide new crushed stone base in areas disturbed for trenching.

D. Forms

1. Side and transverse forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, of a depth to conform to the thickness of the walkway or driveway apron.

2. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked and thoroughly braced and set to the established lines with their upper edge conforming to the grade of the finished walk or driveway apron walkways shall have sufficient pitch to provide for surface drainage, but not to exceed 1/4-in per foot. Driveway aprons shall have sufficient pitch to provide for surface drainage and shall be finished to meet existing grades of driveway and street.

E. Placing and Finishing Concrete

1. Concrete sidewalks, walkways and driveway aprons shall be placed in slabs to dimensions to meet existing walkways and driveway aprons, except as otherwise ordered. The joints between new and existing concrete shall be separated by transverse, preformed expansion joint filler.

2. Preformed expansion joint filler shall be placed adjacent to structures.

3. Concrete shall be placed in such quantity that, after being thoroughly consolidated in place, it shall be 6-in in depth for sidewalks and walkways and 6-in for driveway aprons. Finishing operations shall be delayed until all bled water and water sheen has left the surface and concrete has started to stiffen. After water sheen has disappeared, edging operations shall be completed. After edging and jointing operations, the surface shall be floated with an aluminum or magnesium float. Immediately following floating, the surface shall be steel troweled. If necessary, tooled joints and edges shall be rerun before and after troweling to

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maintain uniformity. Finish with broom at right angles to alignment of walk, then round all edges with 1/4-in radius after brooming.

4. When completed, the sidewalks, walkways and driveway aprons shall be kept moist and protected from traffic and weather for at least 3 days.

END OF SECTION

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SECTION 02576

PAVEMENT REPAIR AND RESURFACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, material, equipment and incidentals required and replace all pavement removed over trenches or otherwise disturbed by the Contractor's operations.

B. New pavement in city streets shall consist of 3.5-inch thick temporary trench width pavement and 1.5-inch thick final full width overlay pavement as shown on the drawings and specified herein, except for streets with concrete or cobble subbases. Streets with concrete or cobble subbases shall consist of 6-inch thick initial trench width pavement and 1.5-inch thick final full width overlay pavement. Work also includes cold planing existing pavements as shown on the drawings and specified herein.

C. Streets, driveways, parking areas or sidewalk pavements damaged or disturbed by the Contractor's operations shall be repaired, replaced or restored in accordance with the requirements specified herein and as directed for the respective type of pavement replacement and in a manner satisfactory to the Owner.

D. Furnish all labor, material, equipment and incidentals required to cold plane where directed by the Engineer.

E. Temporary trench width pavement shall be placed weekly over all open trenches, unless otherwise approved by Engineer or Owner.

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Granular Fill Materials is included in Section 02230.

C. Stamped Bituminous Concrete is included in Section 02850.

1.03 SUBMITTALS (NOT USED)

1.04 REFERENCE STANDARDS

A. Except as otherwise specified herein, the current Standard Specifications for Highways and Bridges, including all addenda, issued by the Commonwealth of Massachusetts Highway Department, shall apply to materials and workmanship required for the work of this Section.

B. American Association of State Highways and Transportation Officials (AASHTO)

1. AASHTO M144 - Standard Specification for Calcium Chloride.

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

1.05 QUALITY ASSURANCE

A. The infra-red bituminous concrete pavement replacement and repairs shall be performed by a fully qualified, experienced paving subcontractor. Submit the following information for the proposed paving subcontractor to the Engineer for review and approval before any infra-red repair work is performed:

1. The number of years of experience in performing specialized work of this nature.

2. A list of municipal clients that the Contractor has performed this type of work for without any pavement deterioration resulting from heat treatment for a period of 5 years after repair.

a. The list shall contain names and telephone numbers of persons who can be called to verify previous satisfactory performance.

b. Work performed for utility companies will not be acceptable.

3. The size, number, type and BTU rating of the operational infra-red heating equipment and heated storage units owned that would be available for this project.

a. The Contractor shall be capable of providing a variety of infra-red units having different shield sizes in order not to needlessly oxidize pavement beyond the limits of the repair.

B. The Contractor shall also be capable of providing multiple crews as needed to complete the work without undue delay, and shall begin work within 7 days from authorized notice to proceed.

C. The Owner reserves the right to approve or disapprove the Contractor, based on the submitted qualifications and a follow up interview.

1.06 MAINTENANCE

A. All temporary trench width pavement shall be maintained by the Contractor until final pavement is placed.

B. Final pavement placed shall be maintained by the Contractor for a period of one year. During this period all areas that have settled or are unsatisfactory for traffic shall be corrected and repaired to the Owner's satisfaction at the Contractor's expense.

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PART 2 PRODUCTS

2.01 MATERIALS

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

B. Temporary trench width pavement shall be Binder Course conforming to the referenced standard, Section M3.11, Class I, Type I-1, bituminous concrete.

C. Final full width pavement shall be Top Course conforming to the referenced standard, Section M3.11, Class I, Type I-1, bituminous concrete, unless otherwise noted.

D. Asphalt emulsions shall be homogeneous and shall show no separation after mixing within 30 days after delivery. They shall conform to the requirements of AASHTO M140 and Section M3.03.0 of the referenced specification, except that its viscosity, Saybolt Furol at 77 degrees F, sec. shall be between 25 and 150.

E. Cationic asphalt emulsion shall be a homogeneous asphalt emulsion and shall remain homogeneous for a minimum of three months. It shall conform to the requirements of AASHTO M208 and Section M3.03.1 of the referenced specification, except that its viscosity, Saybolt Furol at 77 degrees F, sec. shall be between 15 and 20.

F. Stone dust for the cover material shall be free from dirt, organic material, clay balls and film, dust or other objectionable matter, and shall be suitable for the intended use as approved by the Engineer.

G. Repair of temporary pavement shall be with hot mix asphalt or UPM Mix ("Performance Patch") or equal at the discretion of the Engineer.

PART 3 EXECUTION

3.01 GENERAL

A. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with the referenced standard, Sections M3.11 and 460, and as specified herein.

B. Whenever the sub-base becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate the dust.

C. When the air temperature falls below 50 degrees F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.

D. No mixtures shall be placed when the air temperature is below 40 degrees F, nor when the material on which the mixtures are to be placed contains frost or has a surface temperature not suitable to the Engineer.

E. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent

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distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

F. No paving is to be placed in streets from December 15 to April 1 unless otherwise approved by the Owner. As a minimum, the Contractor must maintain temporary pavement on trench surfaces during the winter months.

3.02 TEMPORARY TRENCH WIDTH PAVEMENT

A. Temporary trench width pavement shall be placed wherever existing pavement has been removed or disturbed as soon as practical, but in no case more than one week after backfilling is completed.

1. The bank run gravel sub-base shall be excavated to a depth below the existing pavement, shaped and compacted. The depth of excavation shall be no less than 3.5 inches thick (or 6 inches thick on streets with concrete or cobble subbases). .

2. Temporary trench width pavement shall be placed in two lifts, and compacted by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete without damaging the existing pavement. The new pavement shall be rolled smooth and even with the existing pavement.

3. Hose clean all road surfaces adjacent to the trench area to be paved. No paving is to be placed until subsurface is dry.

4. Temporary trench width pavement shall be maintained in a condition suitable for traffic until replaced or overlaid by final pavement. Defects shall be repaired within 3 days of notification of such defects. Reline all streets with painted pavement markings equal in type and location where existing prior to initial paving.

3.03 FINAL FULL WIDTH PAVEMENT

A. Final full width overlay pavement shall be placed only after trench excavations have been through at least one winter season unless otherwise directed in writing by the Engineer.

B. For all final pavement placement, raise all manhole, drop inlet and catch basin frames, gate valve and curb stop boxes, gas drips, valves, and any other pavement penetrations, as well as coordinate private utility casting adjustments to finished elevation of the new pavement. All raised appurtenances shall be grouted with concrete or otherwise as approved by the Engineer to firmly support them flush with the surface of the new pavement.

C. Temporary trench width pavement shall be constructed as follows:

1. Existing pavement shall be saw-cut a minimum of one foot back from the top of the trench walls so that new pavement will be placed over undisturbed material.

2. Remove and dispose of initial trench width pavement and subbase to at least 3.5 inches (or 6 inches for streets with concrete or cobble subbase) below existing pavement. Shape and

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compact subbase to 95 percent of maximum dry density as determined by ASTM D1557, Method D.

3. Trim loose edges of existing pavement. Broom and apply asphalt emulsion to the face of all existing pavement joints.

4. Where required, install and compact gravel as specified, to level depressions in the pavement sub-grade.

5. Place match-in-kind Binder Course bituminous pavement to the thickness directed by the Engineer.

6. Place Binder Course in two lifts and compact each lift by steel-wheeled roller.

7. Broom and tack coat edges of existing pavement and Binder Course with emulsified or cutback asphalt.

8. Bituminous concrete shall be placed by mechanical spreader except in areas inaccessible to the spreader.

9. All permanent trench-width pavement seams shall be infrared treated as follows. Infra-red treatment of pavement shall not be performed in less than 120 days after installation of permanent pavement unless otherwise directed by the Engineer.

    a. The area to be repaired shall include the entire pavement patch plus an additional 2 feet of existing pavement beyond each side of the initial pavement.

    b. Pavement areas to be repaired shall be swept and hosed clean to remove all loose and foreign materials.

    c. An approved infrared heater not to exceed 15,000 BTUs per square foot per hour shall be positioned over the area to be repaired for a period of time required to soften the existing pavement to a depth of two or more inches. Oxidation of the pavement, caused by excessive heat as determined by the Engineer, shall be avoided. The Contractor shall remove all unsuitable material in the event of oxidation and replace same with new bituminous concrete at his own expense.

    d. The area to be repaired shall be thoroughly scarified to a depth of at least 2 inches.

    e. A recycling agent admixture shall be added to the softened area after scarification, in the amount recommended by the manufacturer or approved by the Engineer, and shall be raked to a uniform, workable condition.

    f. Any additional bituminous concrete mix (MARIMIX or equal) needed shall be obtained from an infra-red heated storage unit required to keep asphalt at near constant temperature throughout the working day. Under no circumstances is any asphalt mix to be used that registers a temperature of under 200 degrees F.

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g. After the paving mixture has been properly admixed and raked to grade, it shall be compacted by means of a steel-wheeled roller of sufficient weight to establish a uniform density comparable to that of adjacent surface within the work area. The finished patch shall be level with no depression retaining water on any of its surface and shall be perfectly flush with the existing, surrounding pavement.

h. The edges around the perimeter of the newly repaired areas shall be sealed with a suitable asphalt emulsion.

i. A cationic asphalt emulsion shall then be hand-sprayed on the patched area and adjacent edges at the approximate rate of 0.1 gallon per square yard to offset the effects of oxidation and seal the entire newly treated area.

j. Stone dust shall be spread over the newly sealed area.

D. Cold planing shall be performed as follows:

1. In areas directed by the Engineer, remove up to 1.5 inches of bituminous concrete using a cold planer. The planing machine shall be specifically designed and built for planing flexible pavements and have the ability to plane concrete patches when encountered in bituminous pavement.

2. The planing machine shall be self-propelled and have the means for planing without tearing or gouging the underlying surface and blading the cutting into a window. The machine shall be capable or being operated at speeds from 10 to 40 fpm and designed such that the operator can at all times observe the planing operation without leaving the control area. A cut to predetermined grade or any specified lesser depth up to the thickness specified in Paragraph 3.02E1 above may be required. The machine shall be adjustable as to crown and depth.

3. All manhole/catch basin covers and grates and other castings at the roadway surfaces shall be lowered to a sufficient depth prior to cold planing. All damaged covers, grates and utility boxes shall be replaced with new covers, grates or utility boxes by the Contractor, at his/her expense.

4. The equipment furnished shall be maintained so as to produce a clean cut in the pavement at all times.

5. The planed surface shall conform generally to the grade and cross slope required and be free from being torn, gouged, shaved, broken or excessively grooved. Cold planning shall be conducted to preserve existing curb reveal and establish/restore roadway crown.

6. Surface texture shall be as specified by the Engineer and in any case be acceptable to traffic in the event resurfacing is delayed. The planing shall be squared off for the full width of the traveled way at the end of each work day.

7. No cutting shall remain on the project at the end of each work day. Dispose of all waste materials as specified in Section 01046 at no additional compensation.

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8. The planed surface shall be free of imperfections of workmanship that will prevent the surface from being resurfaced with new pavement following this operation.

E. Final pavement overlay the entire paved traveled way shall be constructed as follows:

1. Repair all soft and broken areas in temporary and existing pavement. Remove all cold patch that has been placed. Clean all surfaces to be paved of all foreign matter and loose material. All surfaces shall be dry before priming.

2. Where directed by Engineer, cold plane existing pavement.

3. Where required, level depressions in the initial pavement with bituminous material approved by the Engineer.

4. Repair any defects in curbing caused by the Contractor's operations.

5. Apply prime coat to existing and initial pavement.

6. Spread and compact Top Course to 1.5-in thickness over existing pavement to the entire width of the pavement. Bituminous concrete shall be placed by mechanical spreader except in areas inaccessible to the spreader.

7. Wherever the edge of the new pavement passes over existing paved driveways or side streets, or the new pavement ends on existing pavement, the existing pavement shall be grooved 1.5-in deep in the surface such that the surface of the new pavement will slope to the surface of the existing pavement in not less than 18 inches and the new pavement will not be less than 1.5 inches thick.

8. Clean all pavement penetrations and remove all loose aggregate from the site.

3.04 PAVEMENT MARKINGS

A. For temporary trench width pavement which disturbs existing markings, reline all streets with painted pavement markings equal in type and location where existing prior to paving. For final full width overlay pavement, reline all streets with thermoplastic pavement markings equal in type and location where existing prior to paving and as approved by the Owner.

3.05 EXISTING CURBING

A. Existing concrete, bituminous, timber or granite curbing shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing that is damaged during construction shall be replaced with curbing of equal quality and dimension at the Contractor’s expense. Granite curbing removed and reset shall conform to Section 580 of the Massachusetts Highway Department Specifications. Joints between sections shall be pointed after resetting.

3.6 TRAFFIC SIGNAL EQUIPMENT

A. Existing embedded traffic signal loops disturbed or damaged during construction shall be repaired or replaced as required.

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City of Lowell, MA
Marginal Sewer Relief Pipe
Final Pavement Summary

MARGINAL SEWER AREA - PAVEMENT SCHEDULE

Area	Street Name	From Street	To Street	Final Pavement Work
Marginal Sewer	*Foster Street (See figure 1 this section)*	*Middlesex Street*	*Marginal Street*	*Cold Plane and 1.5" Overlay*
Marginal Sewer	*Marginal Street*	Foster Street	*1291 Middlesex Street Property Line*	*Cold Plane and 1.5" Overlay*
Marginal Sewer	*Cross Country - DPW yard*	*See figure 1 this section*	*See figure 1 this section*	*Final Pavement*
Marginal Sewer	*UML South Campus Parking Lot*	*Entire Temporary Easement*	*Entire Temporary Easement*	*Cold Plane and 1.5" Overlay; Infra-red Seal between Existing Pavement and Overla; Striping*
Marginal Sewer	*Pawtucket Street*	*Impacted area shown on Sheet C-1*	*Impacted area shown on Sheet C-1*	*Cold Plane and 1.5" Overlay*

LRTA DRAINAGE IMPROVEMENTS AREA - PAVEMENT SCHEDULE

Area	Street Name	From Street	To Street	Final Pavement Work
LRTA Drainage	*LRTA Driveway*	*Impacted area shown on Sheet T-1*	*Impacted area shown on Sheet T-1*	*Cold Plane and 1.5" Overlay*

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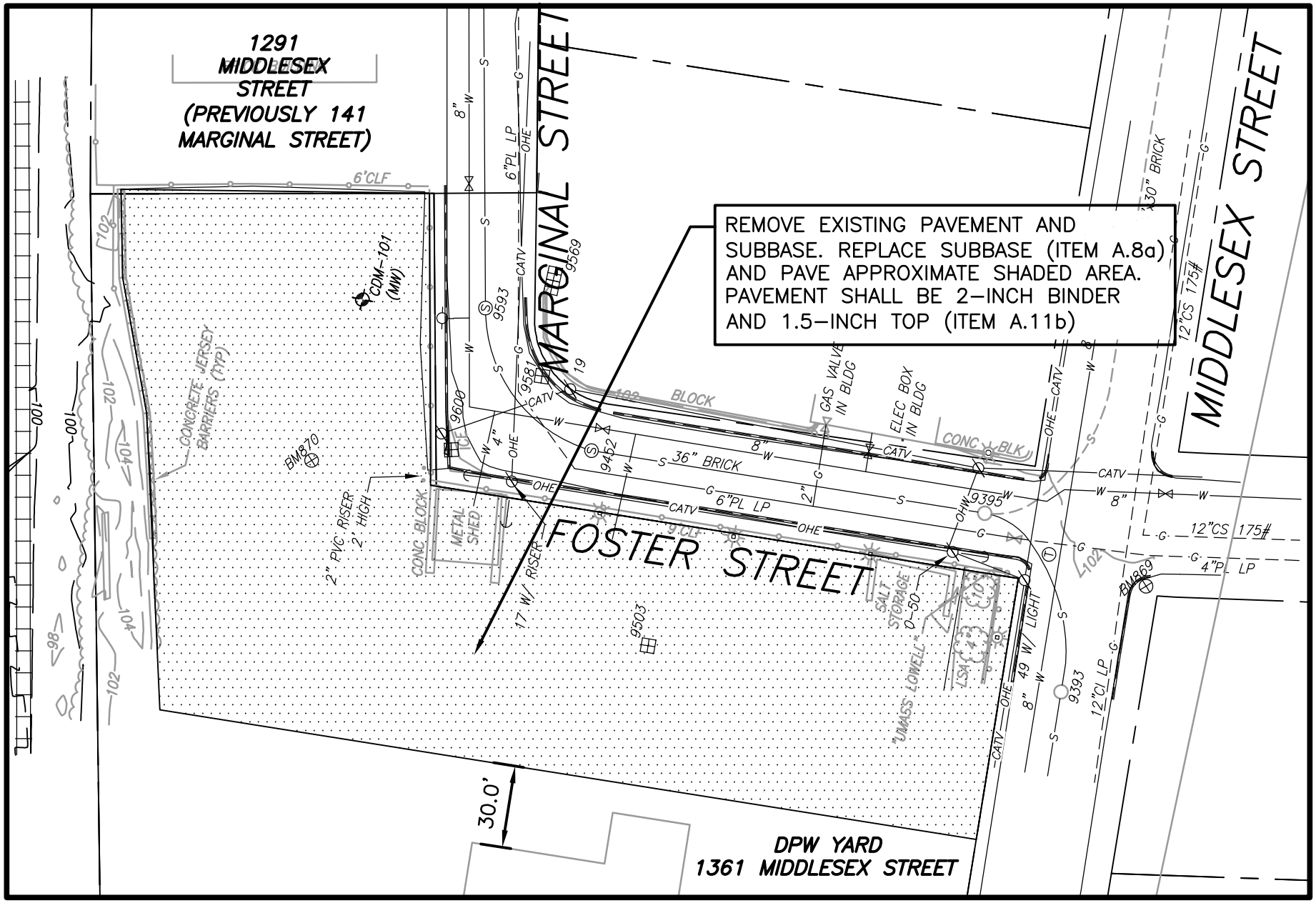

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1" = 50'

25 0 50

SECTION 02576 FIGURE NO. 1

APRIL 2016

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SECTION 02605

PRECAST CONCRETE MANHOLES, STRUCTURES AND CATCH BASINS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required to install precast concrete manholes (including drop inlet type), precast culverts, precast structures, precast catch basins, precast leaching catch basins and frames and covers, and appurtenances as shown on the Drawings and as specified herein.

B. Engage a professional engineer registered in the Commonwealth of Massachusetts to be the Registered Design Professional (RDP) responsible for the design and construction of the precast structure, precast manholes, precast catch basins, hold down slabs, and anchorage to hold down slabs as defined in paragraphs 2.02 and 2.03 of this Section. The RDP shall comply with all requirements of the Massachusetts Building Code and the requirements of this Section.

1.02 RELATED WORK

A. Environmental Protection Procedures are included in Section 01110.

B. Dewatering and Drainage is included in Section 02140.

C. Earthwork is included in Section 02221.

D. Granular fill material is included in Section 02230.

E. Concrete is included in Section 03301.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings, product data, materials of construction, and details of installation. Submittals shall include the following:

1. Base sections, riser sections, eccentric and concentric conical top sections, flat slab tops, grade rings including notarized certificate indicating compliance with ASTM C478.
2. Pipe connections to precast concrete elements.
3. Manhole frame and cover with certification of compliance with the specified ASTM Standard and Class designation.
4. Method of repair for minor damage to precast concrete sections.
5. Sewer brick with certification of compliance with ASTM C32, Grade SS.
6. Granite curb inlets for catch basins.

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B. Design Data

1. Precast concrete structures:

   a. Six copies of sectional plans and elevations showing dimensions and reinforcing steel placement, for review by the Engineer. Drawings shall indicate design criteria used for the design of the precast structures, including but not limited to live load, earth cover, lateral earth pressures, unit weight of soil, groundwater elevation, concrete strength, and reinforcing steel strength. Drawings shall be sealed by the RDP defined in paragraph 1.01B.

   b. After the precast concrete structures have been installed and accepted by the Engineer, submit for project record six copies of structural calculations including assumptions for the precast structures, accounting for all loadings specified. The design calculations shall bear the stamp of the RDP defined in paragraph 1.01B. The design calculations are to be submitted for record purposes only and will not be reviewed by the Engineer. Receipt of these calculations for the project record will not relieve the precast manufacturer of the responsibility to provide materials and designs which will meet these specifications.

   c. Six copies of concrete design mix.

   d. P.E. Certification form, as appended to Section 01300, indicating that the precast structures were designed in accordance with this Section.

2. Precast manholes and catch basins:

   a. Six copies of sectional plans and elevations showing dimensions and reinforcing steel placement for hold-down slabs and anchorage to hold-down slabs, for review by the Engineer. Drawings shall indicate design criteria used for the design of the hold-down slab and anchorage, including but not limited to factor of safety against flotation, earth cover, unit weight of soil, groundwater elevation, concrete strength, and reinforcing steel strength. Drawings shall be sealed by the RDP defined in paragraph 1.01B.

   b. After the precast concrete manholes, catch basins, hold-down slabs, and anchorage to hold-down slabs have been installed and accepted by the Engineer, submit for project record six copies of top slab design calculations, base slab design calculations, buoyancy calculations and calculations for design of hold-down slabs and anchorage, including assumptions, for each precast manhole and catch basin. The calculations shall bear the stamp of the RDP defined in paragraph 1.01B. The calculations are to be submitted for record purposes only and will not be reviewed by the Engineer. Receipt of these calculations for the project record will not relieve the precast manufacturer of the responsibility to provide materials and designs which will meet these specifications.

   c. P.E. Certification form, as appended to Section 01300, indicating that the precast manholes and catch basins were designed and have adequate resistance to flotation in accordance with this Section.

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C. Test Reports

a. Precast concrete structures:

1) Six copies of concrete test cylinder reports from an approved testing laboratory certifying conformance with this Section.

b. Results of leakage tests.

D. Concrete design mix data and concrete test cylinder reports from an approved concrete testing laboratory certifying that the concrete used in the precast structures conforms with the strength requirements specified herein.

E. Submittals shall be made within 7 days of the Effective Date of the Agreement for work related to Marginal Sewer Relief Pipe.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).

4. ASTM C33 - Standard Specification for Concrete Aggregates.

5. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

6. ASTM C150 - Standard Specification for Portland Cement

7. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes

8. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

9. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections

10. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealant.

11. ASTM D4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials.

B. American Concrete Institute (ACI)

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1. ACI 318 - Building Code Requirements for Structural Concrete

2. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

C. American Association of State Highway and Transportation Officials (AASHTO)

1. Standard Specifications for Highway Bridges

D. Occupational Safety and Health Administration (OSHA)

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

1.05 QUALITY ASSURANCE

A. All material shall be new and unused.

B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by Engineer or other Owner representative. Inspection may be made at place of manufacture, at work site following delivery, or both.

C. Materials will be examined for compliance with ASTM standards, this Section and approved manufacturer's drawings. Additional inspection criteria shall include: appearance, dimensions(s), blisters, cracks and soundness.

D. Materials shall be rejected for failure to meet any requirements specified herein. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no additional cost to Owner.

E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by Engineer. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

PART 2 PRODUCTS

2.01 GENERAL

A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.

C. Provide lifting lugs or holes in each precast section for proper handling.

D. Cement shall conform to ASTM C150, Type II cement or equal.

E. Precast concrete sections shall be properly cured prior to shipping. Precast concrete sections shall not be shipped before concrete has attained 3,000 psi compressive strength.

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F. Mark date of manufacture, name and trademark of manufacturer on the inside of each precast section.

2.02 PRECAST CONCRETE STRUCTURES

A. The precast reinforced concrete structure shall be manufactured by Oldcastle Precast, Inc., or equal. The inside dimensions and headroom requirements shall be as indicated on the Drawings. The manufacturer shall notify the Engineer at least five working days prior to placing concrete during the manufacturing process. The Engineer may inspect the reinforcing steel placement and/or require the manufacturer to provide photographs of each section showing the location of all reinforcing steel prior to the placing of concrete. Should it be found that the placement of steel is not as detailed in the shop drawing submittals, the section in question shall be rejected and a replacement section shall be manufactured at the Contractor's expense. Failure to properly notify the Engineer prior to placing concrete shall require the precast sections to be rejected and replacement sections to be manufactured at the Contractor's expense.

B. Structural design calculations and Drawings shall be prepared and signed and sealed by the RDP defined in paragraph 1.01A and submitted for review only. See 1.03.B.1.

C. All precast concrete shall have a minimum compressive strength of 5,000 psi at 28 days. Water shall be kept to a minimum to obtain concrete which is as dense and watertight as possible. The maximum water content shall be 6 gallons per 94 lb sack and the minimum cement factor shall be 6.0 (94 lb) sacks per cubic yard. The above ratios shall be revised for sacks of cement weighing different from 94 pounds per sack.

D. Design Criteria

1. All precast concrete members shall conform to ACI 318 and ACI 350.

2. When the design yield strength "fy" for tension reinforcement exceeds 40,000 psi, the "z" values referred to in ACI 318 shall not exceed 95 kips/in. The flexural stress in reinforcement under service loads "fs" shall be calculated and shall not be greater than 50 percent of the specified yield strength fy.

3. The precast concrete structure's elements shall be designed to support their own weight, the weight of soil above at 130 pcf and shall be capable of withstanding a live load equal to an AASHTO HS-20 highway loading applied to the top slab.

4. All exterior walls shall be designed for an equivalent fluid pressure of 90 lb per sq ft per foot of depth. The top of the pressure diagram shall be assumed to originate at finished ground level. Additional lateral pressure from approaching truck wheels shall be considered in accordance with AASHTO.

5. Minimum wall thickness shall be 8-in.

6. The base slab and walls shall be cast together to form a monolithic base section.

7. The structural design shall take into account discontinuities in the structure produced by openings and joints in the structure.

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8. The structures shall be designed to prevent flotation without the benefit of skin friction when the ground water level is at finished ground surface. Flotation forces shall be resisted by the dead load of the structure and soil directly above the structure. Weight of equipment and piping within the structure and soil frictional forces shall not be considered as being effective in resisting flotation forces. Factor of safety against flotation shall not be less than 1.15. If required, provide reinforced concrete "hold-down" slab firmly anchored to the base of the structure with Type 316 stainless steel bolts. The cost of designing, furnishing and installing a reinforced concrete "hold-down" pad and anchorage of the structure to the "hold-down" pad shall be included in the price for the structure.

9. All walls and slabs shall be analyzed by accepted engineering principles. Openings shall be completely framed as required to carry the full design loads to support walls. All slabs and walls shall be fully reinforced on both faces and the minimum reinforcing shall be No. 5 at 12-in E.F.E.W. Additional reinforcing shall be provided around all openings.

10. The horizontal wall joints shall not be located within 18-in of the horizontal centerline of wall penetrations.

E. The structure shall be built by the manufacturer in no more than four major sections including the top slab if required.

F. Where removable top slabs are used or required, lifting hooks shall be provided.

G. As required, access openings and pipe penetrations shall be formed openings and located as shown on the Drawings.

H. Wall sleeves and other appurtenances as shown on the Drawings, shall be provided to the precast concrete manufacturer for inclusion in the manufacture of the structure.

2.03 PRECAST CONCRETE MANHOLE SECTIONS, CATCH BASINS AND LEACHING CATCH BASINS

A. Precast concrete base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478 and shall meet the following requirements:

1. Design precast concrete base and flat slab top for their own weight, weight of soil at 130 pcf, and a live load equal to AASHTO H-20 truck loading applied at finished grade.

2. Wall thickness shall not be less than 5-in for 48-in diameter reinforced concrete barrel section, 6-in for 60-in diameter, 7-in for 72-in diameter, 8-in for 84-in diameter, or 9-in for 96-in diameter.

3. Bottom slab thickness shall be no less than the riser wall thickness.

4. Construct precast concrete bases as shown on the Drawings.

5. Base, riser and transition top sections shall have tongue and groove joints.

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6. Top section shall be eccentric cone where cover over pipe exceeds 4 feet. Top section shall be a flat slab where cover over top of pipe is 4 feet or less. Top section shall be a plastic lined flat slab where manhole riser sections are to be plastic lined.

7. Provide integrally cast knock-out panels in precast concrete manhole sections at locations, and with sizes shown on Drawings. Knock-out panels shall have no steel reinforcing.
8. Sections shall be cured by an approved method.

9. Leaching catch basin base and/or riser sections shall be manufactured with penetrations to allow infiltration of stormwater.

10. Prevent flotation, with ground water level at finished ground surface, by dead weight of manhole or catch basin and soil load above manhole or catch basin. Do not consider skin friction, soil friction, or weight of equipment or contents in manhole and catch basin. Flotation safety factor shall not be less than 1.15. If required, provide reinforced concrete "hold-down" slab firmly anchored to the base of the manhole or catch basin with Type 316 stainless steel bolts. Buoyancy computations, hold-down slab design computations, and slab anchorage design computations and details shall be prepared and stamped by the RDP defined in paragraph 1.01B. Calculations shall be submitted for review only. See 1.03.B.2.
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2.04 BRICK MASONRY

A. Bricks shall be sound, hard, uniformly burned, regular and uniform in shape and size. Underburned or salmon brick shall not be acceptable. Only whole brick shall be used.

1. Bricks for channels and shelves shall conform to ASTM C32, Grade SS except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.

2. Bricks for raising manhole frames to finished grade shall conform to ASTM C62.

B. Mortar shall be composed of 1 part portland cement, 2 parts sand, and hydrated lime not to exceed 10-lbs to each bag of cement. Portland cement shall be ASTM C150, Type II; hydrated lime shall conform to ASTM C207.

C. Sand shall be washed, cleaned, screened, well graded with all particles passing a No. 4 sieve and conform to ASTM C33.

2.05 DRAIN MANHOLE INVERTS

A. Drain manholes shall have concrete inverts conforming to the invert of all incoming pipes, sloping towards the outlet pipe invert.

B. At changes in direction, the inverts shall be laid out in curves of the longest radius possible, tangent to the centerline of the drain pipes. Shelves shall slope towards the invert channels at 1/2-in per foot.

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2.06 MANHOLE FRAME AND COVER AND CATCH BASIN FRAME AND GRATE

A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30 as a minimum.

B. Manhole covers shall be City Standard cover and shall have a diamond pattern, pickholes, the word SEWER or DRAIN cast in 3-in letters across the center, the words CITY OF LOWELL above the word SEWER or DRAIN cast in 1-5/8-in letters and the words WASTEWATER UTILITY below the word SEWER or DRAIN cast in 1-5/8-in letters.

C. Manhole frame and covers shall be Neenah Foundry, EJ Company, General Foundries, Mechanics Iron Foundry, or equal. Model numbers refer to EJ Company products:

1. Manhole Frame and cover in streets and cross country locations – 0MA200000023 (Previously known as Lebaron LA 326-5)

2. Bolted Manhole Frame and cover (LRTA Drainage Improvements – 00124856W03

D. Standard catch basin frame and grates shall be Lowell City Standard as follows:

1. Catch basin grate and frame in streets – LBF2484 (Previously known as Lebaron LF 248-400).

2. Type ‘A’ catch basins shall be standard catch basin frame and grates as specified above and shall be provided with granite curb inlet stones. See Drawings for details of catch basin work and type.

3. Type ‘B’ catch basins shall be standard catch basin frame and grates as specified above and shall not have curb inlet stones. See Drawings for details of catch basin work and type.

4. Type ‘C’ catch basins shall be provided with granite curb inlet stones, with no frame and cover. See Drawings for details of catch basin work and type.

5. Granite Curb Inlets

   a. The granite for curb inlets shall have a horizontal bed and the top shall be free from ware. The stone shall be sawn or peen hammered on top and the front and back edges shall be pitched true to line.

   b. The granite curb inlet shall be 6 feet in length, plus or minus ½ inch, from 17-19 inches in depth, 6 inches wide at the top and at least 6 inches wide at the bottom.

   c. A gutter mouth of at least 3 inches in depth and at least 2 feet in length shall be cut in the front face of the stone.

6. Catch basin traps shall be East Jordan Co., L-204 or equal.

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2.07 JOINTING PRECAST SECTIONS

A. Seal tongue and groove joints of precast sections with either rubber O-ring gasket or preformed flexible joint sealant. O-ring rubber gaskets shall conform to ASTM C443. Preformed flexible joint sealant shall conform to ASTM C990 and shall be Kent Seal No. 2 by Hamilton-Kent; Ram-Nek by K.T. Snyder Company or equal.

B. Completed joint shall withstand 15 psi internal water pressure without leakage or displacement of gasket or sealant.

2.08 PIPE CONNECTIONS TO MANHOLES

A. Connect pipe to manholes using one of the following methods:

1. Flexible sleeve - Integrally cast sleeve in precast element or install sleeve in a formed or cored opening. Pipe shall be fastened in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal connector; PSX Press-Seal Gasket or equal.

2. Compression gasket - Integrally cast compression gasket in precast element. Compression gasket shall be A-Lok or equal.

3. At the discretion of the Engineer the following procedure may be allowed: Grout in place - Precast manhole section shall have a formed, tapered circular opening larger than the pipe outside diameter. Grout shall be non-shrink and waterproof equal to Hallemite, Waterplug or Embeco. Plastic pipe shall have a waterstop gasket secured to pipe with a stainless steel clamp prior to grouting.

2.09 DAMPPROOFING

A. Dampproofing shall be Hydrocide 700 by BASF Building Systems; Sonneborn Brand Products, 920 AF Fibered Emulsion Mastic (Trowel Grade) by Karnak Corporation, Sealmastic Emulsion Dampproofing Type II – Brush on/ Spray Grade by WR Meadows Inc. or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manhole, Structure, and Catch Basin Installation.

1. Manholes, structure, and catch basins shall be constructed to the dimensions shown on the Drawings and as specified herein. Protect all work against flooding and flotation. Protect all work against flooding and floatation. Construct cast-in-place bases in accordance with the requirements of Division 3 and the details shown on the Drawings.

2. Place manhole, structure, and catch basin base on a bed of 12-in crushed stone as shown on the Drawings. Set manhole and catch basin base grade so that a maximum grade adjustment of 12 inches is required to bring the structure to final grade.

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a. Use precast concrete grade rings or brick and non-shrink mortar to adjust manhole frame and cover or catch basin frame and grate to final grade.

b. Concrete surrounding manhole castings shall be kept 1 inch below existing grade when raising castings for paving.

3. Set precast concrete sections plumb with a 1/4-in maximum out of plumb tolerance allowed. Seal joints of precast sections with either a rubber O-ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finish flush with the adjoining surfaces. Caulk the inside of any leaking joints with lead wool or non-shrink grout to the satisfaction of the Engineer.

4. Allow joints to set for 14 hours before backfilling, unless a shorter period is specifically approved by the Engineer.

5. Plug holes in the concrete sections required for handling with a non-shrink grout or non-shrink grout in combination with concrete plugs. Finish flush on the inside.

6. Cut holes in precast sections to accommodate pipes prior to setting precast sections in place to prevent jarring that may loosen the mortar joints.

7. Backfill carefully and evenly around manholes and catch basin sections.

B. Manhole Pipe Connections

1. Construct manhole and catch basin pipe connections, including pipe stubs, as specified herein. Close or seal pipe stubs for future connections with a gasketed watertight plug.

C. Brickwork

1. Mix mortar only in such quantity as may be required for immediate use. Use mortar before initial set has taken place. Mortar shall be used within 1-1/2 hours and shall be constantly worked with hoe or shovel until used. Anti-freeze mixtures shall not be included in the mortar. Install masonry when the outside temperature is above 40 degrees F unless provisions are made to protect the mortar, bricks and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. Engineer's decision regarding the adequacy of protection against freezing shall be final.

2. Construct channels and shelves of brick and concrete as shown on the Drawings. Brick lined channels shall correspond in shape with the lower half of the pipe. Set shelf elevation at crown of highest pipe and slope 1-in/ft to drain toward the flow through channel. Construct brick surfaces exposed to sewage flow with nominal 2-in by 8-in face exposed (i.e. bricks on edge).

D. Setting Manhole Frame and Cover and Catch Basin Frame and Grate

1. Set manhole covers and frames and catch basin frames and grates in a full mortar bed. Utilize bricks or precast concrete grade rings, a maximum of 8-in thick, to assure frame and cover are set to the finished grade. Set manhole frame and cover and catch basin frame and

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grate to final grade prior to placement of permanent paving. Install curb inlet stones for all Type 'A' and Type 'C' catch basins as shown on the Drawings.

E. Dampproofing

1. Coat outer surfaces of precast sewer manholes with two coats of bituminous dampproofing at the rate of 30 to 60-sq-ft per gallon, in accordance with manufacturer's instructions.

2. Complete leakage testing prior to application of dampproofing.

3.02 LEAKAGE TESTS FOR SEWER MANHOLES

A. Test each liquid-containing manhole for leakage. Engineer shall observe each test. Perform exfiltration test as described below:

B. Assemble manhole in place; fill and point all lifting holes and exterior joints within 6 feet of the ground surface with an approved non-shrinking mortar. Test prior to placing the shelf and invert and before filling and pointing the horizontal joints below 6 feet of depth. Lower ground water table below bottom of the manhole for the duration of the test. Plug all pipes and other openings into the manhole and brace to prevent blow out.

C. Fill manhole with water to the top of the cone section. If the excavation has not been backfilled and no water is observed moving down the surface of the manhole, the manhole is satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, continue the test. A period of time may be permitted to allow for absorption. Following this period, refill manhole to the top of the cone, if necessary and allow at least 8 hours to pass. At the end of the test period, refill the manhole to the top of the cone again, measuring the volume of water added. Extrapolate the refill amount to a 24-hour leakage rate. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed three gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer. If leakage due to a defective section of joint exceeds three gallons per vertical foot per day, the manhole shall be rejected. Uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. Retest the manhole and, if satisfactory, fill and point the interior joints.

D. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.

E. An infiltration test may be substituted for an exfiltration test if the ground water table is above the highest joint in the manhole. If there is no leakage into the manhole as determined by the Engineer, the manhole will be considered water-tight. If the Engineer is not satisfied, testing shall be performed as previously described.

F. A vacuum test may be substituted for a leakage test as follows:

1. Where the excavation has not been backfilled, the filling and pointing of exterior joints shall not be necessary prior to performing this test.

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2. The vacuum test shall be conducted as follows:

   a. The compression band shall be inflated to affect a seal between the vacuum base and the top of the manhole. The vacuum pump shall then be connected to the outlet port with the valve open and a vacuum of 10-in Hg (20-in of Hg absolute) drawn. The valve shall then be closed.

   b. The following test criteria shall apply to 4-ft and 5-ft diameter manholes:

      (1) A drop of 1-in Hg shall be allowed over a 2-minute period for manholes 0-10 feet deep.

      (2) A drop of 1-in Hg shall be allowed over a 2-1/2-minute period for manholes 10-15 feet deep.

      (3) A drop of 1-in Hg shall be allowed over a 3-minute period for manholes 15-30 feet deep.

3. If the pressure drop exceeds the acceptable limits the Contractor shall be allowed to make necessary repairs, as approved by the Engineer. The manhole shall then be re-tested.

4. If the manhole fails to meet the minimum requirements of the vacuum test when re-tested, it may be water tested as outlined in paragraph 3.02.

5. Upon completion of a successful vacuum test, the interior and exterior joints shall be filled and pointed.

G. All visible leaks which occur after backfilling shall be sealed by approved methods.

3.03 LEAKAGE TESTS FOR DRAIN MANHOLES AND CATCH BASINS

A. The Engineer will visually inspect drain manholes and catch basins for possible leaks before backfilling is allowed. All joints shall be sealed to the satisfaction of the engineer.

B. The Engineer may require an exfiltration test as described for sewer manholes on any structure for which he/she deems appropriate.

3.04 CLEANING

A. Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

END OF SECTION

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SECTION 02610

NEW GRAVITY PIPELINE TESTING AND CLEANING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. All new sewer pipes shall be cleaned, televised and shall have all joints tested.

B. All drain pipes shall be cleaned and visually inspected during a high groundwater period. If excessive dry weather flow is observed in the pipe, as defined by applicable standards, the Engineer may direct the Contractor to complete further inspection work (i.e., television inspection, etc.), at the Contractor's expense, to determine if the pipe was improperly installed or requires repair

C. Furnish all necessary labor, materials, equipment, services and incidentals required to clean all gravity pipes and to visually inspect by closed-circuit television all new sewer pipes.

D. Furnish all necessary labor, materials, equipment, services and incidentals required to test all sewer joints. Joint testing shall be accomplished by utilizing a void pressure monitoring system. Generally, this shall be accomplished by applying a positive pressure to each joint, allowing time for the system to stabilize and measuring the amount of pressure decay over a given length of time.

E. Furnish all necessary labor, materials, equipment, services and incidentals required to complete television inspections, including, but not limited to, all recording and playback equipment, materials. Televising shall be done one section (i.e. manhole to manhole) at a time. Copies of the television inspections shall be provided on DVD media.

F. All inspections shall be witnessed by the Engineer.

1.02 RELATED WORK

A. Reinforced concrete pipe is included in Section 02612.

B. Ductile iron pipe is included in Section 02616

C. Polyvinyl chloride pipe is included in Section 02622.

D. Polypropylene pipe is included in Section 02623.

E. Allowable deflection testing of PVC pipe is included in Section 02622.

F. Allowable deflection testing of Polypropylene pipe is included in Section 02623.

E. Television inspection of gravity pipelines is include in Section 02651.

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PART 2 PRODUCTS

2.01 EQUIPMENT

A. A hydrostatic joint testing device that can be pulled through the sewer lines shall be used for joint testing. Testing shall be accomplished by isolating the joint or area to be tested with the testing device or devices and applying a positive hydrostatic pressure into the created, isolated void area. Pressure readings shall be displayed on an above ground gauge with a range of 0 to 10 psi.

B. Void pressure data shall be transmitted electronically to the surface and without the use of the test medium or hoes. All test monitoring shall be above ground and in a location that will allow for simultaneous continued observation of the television monitor and test monitoring equipment by the Engineer.

PART 3 EXECUTION

3.01 CLEANING

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 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.

3.02 TELEVISION INSPECTION

A. All new gravity sewer pipelines shall be television inspected by the Contractor prior to acceptance to assure proper jointing and flow characteristics. Television inspections shall not be scheduled until construction of other utilities in the same area is completed and the pipeline under consideration has been backfilled and compacted to sub-grade elevation. Television inspection will be performed after the pipes have been cleaned.

3.03 JOINT TESTING

A. Existing hydrostatic head shall be established by inserting a pipe probe into the backfill material at the crown of the pipe at the downstream manhole and applying pressure until equilibrium is attained. This is the back pressure that all test pressures for that section of line shall be increased by.

B. A precise pressure of 4 psi above the existing hydrostatic head shall be applied to each joint. Once the pressure of 4 psi above hydrostatic head at the joint has been recorded on the gauge above ground, the water flow shall be stopped and the pressure gauge observed for 30 seconds. Should the pressure on the joint drop 0.5 psi or more within 30 seconds, the joint will have failed the test. Joints that fail the test shall be repaired as directed by the Engineer and re-tested by the same procedure until the joints pass the pressure test.

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C. During the joint testing program, complete records shall be kept, recording the location of the manhole section in which the testing is done, location of each joint tested, test pressures used, and the test results.

D. Pipe joints that fail the joint test shall be repaired to the satisfaction of the Engineer and shall be subject another joint test at the direction of the Engineer.

END OF SECTION

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SECTION 02611

WATER MAIN TESTING AND CLEANING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to clean, test and disinfect all new water mains installed under this Contract as specified herein.

1.02 RELATED WORK

A. Ductile iron pipe is included in Section 02616.

1.03 SUBMITTALS

A. Submit the water main disinfection and testing plan to the Engineer for review at least 10 days before testing is started.

1.04 REFERENCE STANDARDS

A. American Water Works Association (AWWA)

1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

2. AWWA C651 - Disinfecting Water Mains.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Furnish all necessary equipment and labor for cleaning, testing and chlorinating water mains. The procedures and methods shall be reviewed by the Engineer.

B. Make any taps and furnish all necessary caps, plugs, etc, as required in conjunction with testing water mains. Furnish a test pump, gauges and any other equipment required in conjunction with carrying out the hydrostatic tests.

C. The Contractor shall coordinate with the Lowell Regional Wastewater Utility for a water supply to test and chlorinate the water mains. Water use may be metered by the Utility and backflow control procedures should be used to protect the water supply.

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3.02 CLEANING WATER MAINS

A. As pipe laying progresses and at the conclusion of the work thoroughly clean all new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

3.03 TESTING WATER MAINS

A. All pressure pipelines shall be pressure and leakage tested. Pipelines shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure and this pressure maintained for at least 2 hours. The leakage test shall be conducted at the maximum operating pressure as determined by the Engineer, and this pressure shall be maintained for at least two hours. The test pump and water supply shall be arranged to allow accurate measurement of the water required to maintain the test pressure. Where applicable, hydrant branch gate valves shall remain open during this test. The amount of leakage that will be permitted shall be in accordance with AWWA C600.

3.04 CHLORINATION OF WATER MAINS

A. Before being placed in service, all new potable water pipelines shall be chlorinated using the continuous feed method specified in AWWA C651. The procedure shall be approved by the Engineer in advance.

B. The location of the chlorination and sampling points will be determined by the Engineer in the field but at a minimum shall be placed at the beginning and end of each newly installed section of water main, on each branch line and at 1,200-linear-ft increments. Taps for chlorination and sampling shall be installed. Uncover and backfill the taps as required. Bacteriological sampling from hydrants will not be permitted.

C. The general procedure for chlorination shall be first to flush all dirty or discolored water from the lines and then introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for 24 hours.

D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with potable water. All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means. No discharge to any storm sewer or natural watercourse will be allowed. Bacteriological sampling and analysis of the replacement water may then be made by the Engineer in full accordance with AWWA C651. The line shall not be placed in service until the requirements of Lowell Regional Water Utility and the Public Health Department are met.

E. Special disinfecting procedures acceptable to the Engineer and the Lowell Regional Water Utility shall be used in connections to existing pipelines and where the method outlined above is not practical.

END OF SECTION

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SECTION 02612

REINFORCED CONCRETE DRAIN AND SEWER PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary and install and test reinforced concrete pipe for drains and sewers complete as shown on the Drawings and as specified herein.

B. All pipes and fittings shall be manufactured for this project and no pipe shall be furnished from stock.

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Granular fill materials are included in Section 02230.

C. Testing and cleaning of pipelines is included in Section 02610.

D. Connection to and Work on Existing System is included in Section 02658.

E. Concrete is included in Division 3.

1.03 SUBMITTALS

A. Within 7 days of the Effective Date of the Agreement submit the name of the pipe and fitting supplier and a list of materials to be furnished for Marginal Sewer Relief project.

B. Submit, in accordance with Section 01300, shop drawings showing layout and details of reinforcement, joint, method of manufacture and installation of pipe, specials and fittings, and a schedule of pipe lengths by diameter for the entire job.

C. Submit with the shop drawings certification from the manufacturer that the fine and course aggregates used in manufacture of the concrete pipe comply with the requirements of Paragraph 2.01C. Documentation shall be less than 6 months old and shall indicate the source of the aggregates and the date of analysis.

D. Prior to each shipment of pipe, submit the manufacturer's certification that the pipe for this Contract conforms to the ASTM Standards specified herein.

E. Submit the results of the compressive strength tests to the Engineer.

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1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

3. ASTM C150 - Standard Specification for Portland Cement.

4. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.

5. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

6. ASTM E329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

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

1.05 QUALITY ASSURANCE

A. The manufacturer shall perform the acceptance tests specified in ASTM C76, Paragraph 5.1.2.

B. Reinforced concrete pipe manufactured for this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory provided by the Owner. The manufacturer's cooperation in these inspections shall be required. The cost of this inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe will be borne by the Owner. The pipe manufacturer shall be required to:

1. Have sufficient pipe made in advance so that a minimum of approximately 1,000-ft will be approved at each plant inspection. Pay for each plant inspection that does not result in this minimum length of R.C. pipe being approved, the cost being deducted from monthly progress payments.

2. Notify the independent testing laboratory at least 48 hours prior to requesting pipe inspection.

C. Inspection of the pipe will be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

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PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Except as otherwise specified herein, pipe shall conform to ASTM C76, Class IV, Wall B or C. The carrier pipe for the railroad crossing shall be Class V, Wall C. The pipe interior shall be smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. The concrete mass shall be dense and uniform

B. Cement shall be non-air-entraining Portland cement conforming to ASTM C150, Type II. The use of any admixture shall be subject to the specific approval of the Engineer.

C. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8 percent when subjected to 5 cycles of the soundness test using magnesium sulfate. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8 percent when subjected to 5 cycles of the soundness test using magnesium sulfate. Documentation that the aggregates to be used in the manufacture of reinforced concrete pipe meet these requirements shall be submitted to the Engineer as stated in Paragraph 1.03 above.

D. The 28-day compressive strength of the concrete, as indicated by cores cut from the pipe shall be equal to or greater than the design strength of the concrete. The concrete mass shall be dense and uniform. The average absorption shall not exceed 5.5 percent of the dry weight and no specimen shall exceed 6.0 percent. Reinforcement shall be circular for all concrete pipe. Quadrant steel shall not be used. Reinforcement shall be installed in both the bell and the spigot. At least one circumferential reinforcement wire shall be in both the bell and spigot area and reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling and after installation. When cores indicate that reinforcing steel has less than 85 percent bond the pipe shall be subjected to a 3-edge bearing test to 13 psi to verify strength and water tightness.

E. Pipe may be rejected for any of the following reasons:

1. Exposure of any wires, positioning spacers or chairs used to hold the reinforcement cage in position, or steel reinforcement in any surface of the pipe, except as permitted by Section 8.2 of ASTM C76.

2. Transverse reinforcing steel found to be in excess of 1/4-in out of specified position after the pipe is molded.

3. Any shattering or flaking of concrete at a crack.

4. Voids, with the exception of a few minor bugholes, on the interior and exterior surfaces of the pipe exceeding 1/4 inches in depth unless properly and soundly pointed with mortar or other approved material.

5. Unauthorized application of any wash coat of cement or grout. Any pipe dressing procedures shall be subject to approval of the Engineer.

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6. A deficiency of greater than 1/4-inch from the specified wall thickness of the pipe 30-inc or smaller in diameter.

7. A hollow spot (identified by tapping the internal surface of the pipe) which is greater than 30-in in length or wider than 3 times the specified wall thickness. Repair of such defective areas not exceeding these limitations may be made as specified in Paragraph 2.01R.

8. Defects that indicate imperfect molding of concrete; or any surface defect indicating honeycomb or open texture (rock pockets) greater in size than area equal to a square with a side dimension of 2-1/2 times the wall thickness or deeper than two times the maximum graded aggregate size; or local deficiency of cement resulting in loosely bonded concrete, the area of which exceeds in size the limits of area described in Paragraph 2.01E9 above when the defective concrete is removed. Repair of such defects not exceeding these limits may be made as specified in Paragraph 2.01R.

9. Any of the following:

   a. A crack having a width of 0.005 to 0.01 inches throughout a continuous length of 36 inches or more.

   b. A crack having a width of 0.0 to 0.03 inches or more throughout a continuous length of 1 foot or more.

   c. Any crack greater than 0.005 inches extending through the wall of the pipe and having a length in excess of the wall thickness.

   d. Any crack showing two visible lines of separation for a continuous length of 2 feet or more, or an interrupted length of 3 feet or more anywhere in evidence, both inside and outside.

   e. Cracks anywhere greater than 0.03 inches in width.

F. The pipe shall be clearly marked as required by ASTM C76 in a manner acceptable to the Engineer. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until the compressive strength of the concrete has attained 4,000 psi.

G. Pipe shall have a minimum laying length of approximately 8 feet, except for closure and other special pieces as approved by the Engineer. Have available at the site of the work sufficient pipe of various lengths to affect closure at manholes or structures that cannot be located to accommodate standard lengths. Short lengths of pipe made for closure etc., may be used in the pipeline at the end of construction if properly spaced. The length of the incoming and outgoing concrete pipe at each structure shall not exceed 4 feet, except where the joint is cast flush with the exterior wall of the structure, where steel wall fittings are provided or where otherwise noted on the Drawings. Maximum laying length shall not exceed 16-ft, but the installation of 16-ft lengths will depend upon the ability to handle such lengths of pipe in sheeted trenches, comply with trench width requirements, maintain the integrity of the sheeting and avoid disturbance to adjacent ground. If in the opinion of the Engineer the use of 16-ft lengths is impracticable, shorter lengths shall be used.

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H. Each length of pipe shall be checked against the length noted on the shop drawings. Pipe more than 1-1/2 inches longer than that shown on the shop drawings shall not be used on this project. Variations in length of the same pipe shall not exceed ASTM C76 requirements.

I. During manufacturing, measuring devices shall be used to assure joint assembly is within the tolerance of ASTM C76 and this Section.

J. The Engineer shall have the right to take samples of the concrete after it has been mixed or as it is being placed in the forms or molds and to make such inspection and tests thereof as he/she may wish.

K. At the start of the work, a set of test cylinders shall be taken each day on which pipe is manufactured for the project or more often if required. This may ultimately be reduced to one set of three specimens for every 50 cu yds of concrete placed, if the uniformity of results warrants and if approved by the Engineer. At the start of the work, a relationship shall be established between ultimate strength of test cylinders stored in a standard manner as compared to cylinders steam cured with the pipe and as compared to cores taken from the corresponding finished pipe. At least five sets of tests shall be made.

L. The Engineer shall have the right to cut cores from such pieces of the finished pipe as he/she selects for inspection and such tests as he/she may wish to apply. Holes left by the removal of cores shall be filled in an approved manner by and at the expense of the manufacturer. Core drilling shall be carried out by the pipe manufacturer at his/her expense. The number of cores shall not exceed the requirements of ASTM C76.

M. Test cores may be taken for every 500 linear feet of pipe manufactured, but not less than once each day on which pipe is manufactured for the project. Cores may be reduced to one set of two per week (or possibly fewer, but not less than one set for every 1,500 linear feet), if a satisfactory relationship is established between cores and cylinders made and cured in the standard manner. This relationship shall not vary by more than 10 percent more or less from the average ratio. Cores may be drilled in any manner which will provide a smooth core face. All pipe cylinders and cores shall be 4 inches in diameter. Cores shall be carefully saw-trimmed and capped in a vertical position with a sulfur cap of minimum thickness, at least one day before being tested.

N. Core testing shall conform to Standard ASTM Methods.

O. At the time of inspection, the pipe will be carefully examined for compliance with the appropriate ASTM standard, as specified herein and shop drawings. All pipes shall be inspected for general appearance, dimension, "scratch-strength," blisters, cracks, roughness, soundness, etc. All pipes will be checked for soundness by being tapped and scratched at least once on every 50 sq in of pipe surface. The surface shall be dense and close-textured. Cores also shall serve as a basis for rejection of pipe, particularly if lamination or poor bond of reinforcement is apparent.

P. The manufacturer shall use measuring devices to assure joint assembly is within tolerances of ASTM C76 and as specified herein. If, during construction, the pipes cannot be satisfactorily joined, the manufacturer shall pre-join the pipe at the plant.

Q. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. Only that pipe actually conforming to the specifications and accepted will be listed for approval, shipment and payment. Approved pipe will be so stamped or stenciled on the inside before it is

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shipped. All pipe which has been damaged after delivery will be rejected and if such pipe already has been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.

R. Pits, blisters, rough spots, breakage and other imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of seven days and 7,000 psi at the end of 28 days, when tested in 3-in cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

2.02 JOINTS FOR CONCRETE PIPE

A. Joints shall be concrete and rubber tongue and groove or bell and spigot type joint conforming to ASTM C361 with provisions for using a round rubber O-Ring gasket in a recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2 degrees and 2-1/2 degrees. The diameters of the joint surfaces which compress the gasket shall not vary from the true diameters by more than 1/16 inches.

B. The round rubber O-Ring gaskets shall conform to ASTM C443 except as otherwise specified herein. Two gaskets shall be submitted to the Engineer for tests at least 30 days before joining any the pipe.

C. The gaskets shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of 13 psi for a period of 10 minutes without showing any leakage by the gasket or displacement of it. The pipe manufacturer shall provide facilities for testing the effectiveness of the joints against leakage and one such test may be required for each 500-ft of pipe for each type of joint manufactured. Such tests shall be made by an internal or external pressure against the joint of at least 13 psi for a period of ten minutes in accordance with ASTM C443. The completed joint, when installed in place in the work, shall be capable of withstanding a groundwater pressure of 13 psi without exceeding the allowable leakage specified for the pipe testing.

D. The ends of the pipe shall be made true to form and dimension and the bell shall be made by casting against steel forms. The manufacturer shall inspect all pipe joint surfaces for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all pipe meets the requirements of ASTM C76, as specified herein and the joint design.

PART 3 EXECUTION

3.01 LAYING CONCRETE PIPE

A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or fittings and the joint surfaces. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective.

C. As soon as the excavation is completed to the normal grade of the bottom of the trench, place crushed stone in the trench and the pipe shall be firmly bedded in this gravel to conform

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accurately to the lines and grades indicated on the Drawings. Crushed stone shall conform to the requirements of Section 02230. Blocking under the pipe will not be permitted.

D. Prior to the installation of any pipe, review the proposed method of installation with the Engineer. Jacks or come-alongs shall be used to force the pipe home. The use of other methods, including the use of motor driven equipment, shall be reviewed by the Engineer. The Engineer reserves the right to direct the Contractor to revise his operation at any time within this Contract.

E. Jacks or come-alongs shall be anchored sufficiently back along the pipeline (a minimum of five lengths) so that the pulling force will not dislodge the pieces of pipe already in place. Only a jack or come-along shall be employed to force the pipe home smoothly and evenly and hold the pipe while backfilling is in progress. Under no circumstances shall crowbars be used.

F. Crushed stone shall be placed and compacted to give complete vertical and lateral support for the lower section of the pipe as indicated on the Drawings. A depression shall be left in the supporting gravel at the joint to prevent contamination of the rubber gasket immediately before being forced home. Before the pipe is lowered into the trench, the spigot and bell shall be cleaned and free from dirt. Gasket and bell shall be lubricated by a vegetable lubricant which is not soluble in water, furnished by the pipe manufacturer and harmless to the rubber gasket. The pipe shall be properly aligned in the trench to avoid any possibility of contact with the side of the trench and fouling the gasket. As soon as the spigot is centered in the bell of the previously laid pipe, it shall be forced home with jacks or come-alongs. After the gasket is compressed and before the pipe is brought fully home, each gasket shall be carefully checked for proper position around the full circumference of the joint. Steel inserts shall be used to prevent the pipe from going home until the feeler gauge is used to check the final position of the gasket.

G. As soon as the pipe is in place and before the come-along is released, backfill shall be placed as indicated on the Drawings and compacted for at least one-half the length of pipe. Not until this backfill is placed shall the come-along be released. If any motion at joints can be detected, a greater amount of backfill shall be placed before pressure is released. When pipe laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by a watertight plug or other approved means.

H. Carefully regulate the equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall promptly and satisfactorily be repaired or replaced at the Contractor's expense.

3.02 TESTING AND CLEANING

A. New Gravity Pipeline Testing and cleaning shall be as specified in Section 02610.

END OF SECTION

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SECTION 02616

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install, disinfect (water) and test ductile iron pipe and fittings for sanitary sewers, water mains, drains and catch basin connections as shown on the Drawings and as specified herein.

B. Piping shall be located substantially as shown on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference between pipes or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve them from installing and jointing different or additional items where required to achieve a complete piping system.

C. Where the word "pipe" is used it shall refer to pipe, fittings, or appurtenances unless otherwise noted.

1.02 RELATED WORK

A. Environmental Protection Procedures is included in Section 01110.

B. Earthwork is included in Section 02221.

C. Granular Fill Material is included in Section 02230.

D. Sedimentation and Erosion Control is included in Section 02270.

E. Pavement Repair and Resurfacing is included in Section 02576.

F. Valve, Hydrants and Appurtenances are included in Section 02640.

G. Connection to and Work on Existing System is included in Section 02658.

H. Testing and cleaning of New Gravity Pipe is included in Section 02610.

I. Testing, cleaning, and disinfection of water mains and services is included in Section 02611.

J. Water service connection and repairs are included in Section 02725.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data for review. Design computations for sewer and drain pipe thicknesses shall be submitted to the Engineer.

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B. Prior to shipment of pipe, submit a certified affidavit of compliance from the manufacturer stating that the pipe, fittings, gaskets, linings and exterior coatings for this project have been manufactured and tested in accordance with AWWA and ASTM standards and requirements specified herein.

C. Submittals shall be made within 7 days of the Effective Date of the Agreement for Marginal Sewer Relief project.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

2. ASTM A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.

3. ASTM A746 – Standard Specification for Ductile Iron gravity sewer pipe.

4. ASTM C150 - Standard Specification for Portland cement.

B. American Water Works Association (AWWA)

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-In through 48-in (75mm Through 1200mm) for Water and Other Liquids.

3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

4. AWWA C150 - Thickness Design of Ductile-Iron Pipe.

5. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.

6. AWWA C153 - Ductile- Iron Compact Fittings, 3-in through 64-in (76 mm Through 1600 mm), for Water and Other Liquids.

7. AWWA C550 – Protective Interior Coasting for Valves and Hydrants.

8. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

9. AWWA C606 – Grooved and Shouldered Joints.

10. AWWA C651 - Disinfecting Water Mains.

C. National Sanitation Foundation (NSF)

1. NSF61 – Drinking water system components health effects.

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

1.05 QUALITY ASSURANCE

A. Each length of ductile iron pipe supplied for the project shall be hydrostatically tested at the point of manufacture to 500 psi for duration of 10 seconds per AWWA C151. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture of the pipe wall. Certified test results shall be furnished in duplicate to the Engineer prior to time of shipment.

B. All ductile-iron pipe and fittings to be installed under this project shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. Furnish in duplicate to the Engineer sworn certificates of such tests and their results prior to the shipment of the pipe.

C. All pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory selected by the Owner at the Owner's expense.

D. Inspection of the pipe and fittings will also be made by the Engineer or representative of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job.

E. All pipe and fittings shall be permanently marked with the following information:

1. Manufacturer, date.

2. Size, type, class, or wall thickness.

3. Standard produced to (AWWA, ASTM, etc).

1.06 DELIVERY, STORAGE AND HANDLING

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe. Under no circumstances shall the pipe be dropped or skidded against each other. Slings, hooks, or pipe tongs shall be used in pipe handling.

B. Materials, if stored, shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.

C. Pipe shall not be stacked higher than the limits recommended by its manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Stacking shall conform to manufacturer's recommendations.

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D. Gaskets for mechanical and push-on joints to be stored shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe

1. Ductile iron pipe water main shall conform to AWWA C151, Class 52. Ductile iron pipe for sewer/drain shall conform to ASTM A746. Pipe shall be supplied in standard lengths as much as possible.

2. Ductile iron pipe shall be by U.S. Pipe and Foundry Company, Inc.; American Cast Iron Pipe Company or equal.

B. Joints

1. Ductile iron pipe shall have rubber-gasket push-on joint or rubber-gasket mechanical joint. Rubber-gasket joints shall conform to AWWA C111. Gasket shall be of SBR.

2. All restrained joints for water mains shall be restrained push-on joint pipe or mechanical restrained joints. Restraint of field cut ductile iron pipe shall be provided by retainer gland joint restraint. Restrained joints shall be suitable for a working pressure of 250 psi with a minimum safety factor of 2:1 and fabricated of heavy section ductile iron casting. Gaskets shall meet the material requirements of ANSI/AWWA C111 for mechanical joint gaskets. Bolts and nuts as required shall be carbon steel conforming to ASTM A307, Grade B. Glands and restraining devices shall be made of ductile iron, with glands conforming to ASTM A536-80. Dimensions of the gland shall be such that it can be used with standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/a21.53 of latest revision. Twist–off nuts shall be used to insure proper actuating of the restraining devices on retained gland systems. Restrained joint push-on pipe shall be TR Flex, U.S. Pipe or equal. Retainer gland systems for mechanical joint pipe shall be EBBA Iron, Inc., MEGALUG or equal. Required lengths of restrained joints are shown on the Drawings.

3. Bell joint leak clamps for protecting existing water mains shall be ROMAC model series 416 or equal.

C. Fittings

1. Ductile iron pipe fittings shall be the compact type meeting the requirements of ANSI/AWWA C110 and C153 as applicable with a pressure rating of at least 350 psi. Fittings shall have the same pressure rating, as a minimum, of the connecting pipe.

2. Closures shall be made with mechanical joint ductile iron solid sleeves and shall be located in straight runs of pipe at minimum cover outside the limits of restrained joint sections. Location of closures shall be subject to approval of the Engineer.

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C. Dome Grate

1. Ductile iron dome grate shall be a secured cap with screws and shall be Watts model FD-100-K or equal.

D. Exterior Coating and Interior Lining

1. Ductile iron drain pipe and fittings shall have a bituminous outside coating in accordance with ANSI/AWWA C151 and C110, respectively.

2. Ductile iron water pipe and fittings shall have a cement mortar lining and asphaltic seal coat in accordance with AWWA C104 double thickness. A second application of seal coat shall be applied to the pipe and fitting interiors after the initial coat has set.

3. Ductile iron sewer pipe and fittings shall be internally lined with a ceramic-filled, amine-cured epoxy, Protecto 401 by Indurall, or equal. The lining thickness shall be 40 mils minimum. Application shall be performed by an applicator approved by the coating manufacturer, in accordance with manufacturer's instructions and under controlled conditions at the applicator's shop or pipe manufacturer's plant. Applicator shall submit a certified affidavit of compliance with manufacturer's instructions and requirements specified herein.

E. Transition pipe couplings for water mains shall be Style 162 and closure pipe couplings shall be Style 38 or 138, as manufactured by Dresser Mfg., or equal. Couplings shall be furnished with black steel bolts and nuts and pipe stop removed. Gaskets shall be of a material- suitable for exposure to liquid within the pipe.

PART 3 EXECUTION

3.01 GENERAL

A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe and fittings shall not be dropped. All pipe and fittings shall be examined before laying and no piece shall be installed which is found to be defective. Damage to the pipe coatings shall be repaired per manufacturer's recommendations.

B. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work and when installed or laid, shall conform to the lines and grades required.

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3.02 INSTALLING DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA C600, except as otherwise specified herein. As soon as the excavation is complete to normal grade of the bottom of the trench, crushed stone bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Crushed stone bedding shall be placed evenly on each side of the pipe to the spring-line per details shown on the Drawings. Blocking will not be permitted.

B. All pipe shall be sound and clean before laying. When laying is not in progress, open ends of the pipe shall be closed by a watertight plug or other approved means. Sufficient backfill shall be placed to prevent flotation. The deflection at joints shall not exceed 75 percent of allowable deflection recommended by manufacturer.

C. All ductile iron pipe laid underground shall have a minimum of 3 feet of cover unless otherwise shown on the Drawings or as specified herein. Pipe shall be laid such that the invert elevations shown on the Drawings are not exceeded.

D. Fittings, in addition to those shown on the Drawings shall be provided, where required, in crossing utilities which may be encountered upon opening the trench. Solid sleeve closures shall be installed at locations approved by the Engineer.

E. The pipe interior shall be maintained dry and broom clean throughout the construction period.

F. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged. Field cut ends shall be sealed with Protecto 401 (or for potable water, approved epoxy) in accordance with manufacturer's instructions. Cutting of restrained joint pipe will not be allowed, unless approved at specific joints in conjunction with the use of restrainer glands by EBAA Iron or field adaptable restrained joints.

G. Jointing Ductile-Iron Pipe

1. Push-on joints shall be made in strict accordance with manufacturer's instructions and AWWA C600. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe. The joint surfaces shall be cleaned and lubricated and the plain end of the pipe shall be aligned with the bell of the pipe to which it is to be joined and pushed home.

2. Mechanical joints shall be assembled in strict accordance with the manufacturer's instructions and AWWA C600. Pipe shall be laid with bell ends looking ahead. To assemble the joints in the field, thoroughly clean and lubricate the joint surfaces and rubber gasket. Bolts shall be tightened to the specified torques. Under no condition shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.

3. Bolts in mechanical or restrained joints shall be tightened alternately and evenly.

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3.03 CHIMNEYS

A. Ductile iron chimneys shall be installed according to the detail on the Drawings at locations determined by the Engineer.

3.04 SEWER SERVICE CONNECTIONS

A. Sewer service connections shall be installed at a minimum slope of 2 percent at the locations and to the limits determined by the Engineer in the field. In each case the end shall be connected to the existing sewer service at the property line.

B. Service connections shall be 6-in diameter unless otherwise shown on the Drawings.

3.05 CONNECTIONS TO STRUCTURES

A. Wherever a pipe 3 inches in diameter or larger passes from concrete to earth horizontally, two flexible joints spaced from 2 to 4 feet apart depending on pipe size shall be installed, within 2 feet of the exterior face of the wall, whether or not shown on the Drawings.

3.06 TESTING

A. After installation, sewer pipe shall be tested for compliance as specified in Section 02610.

B. After installation, water pipe shall be tested for compliance as specified in Section 02611.

3.07 CLEANING

A. At the conclusion of the work, thoroughly clean the entire pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material that may have entered during the construction period. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.

END OF SECTION

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SECTION 02622

POLYVINYL CHLORIDE (PVC) GRAVITY PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install and test polyvinyl chloride (PVC) sewer and sewer service pipe and fittings, and drain pipe and fittings, complete as shown on the Drawings and as specified herein.

B. Pipe or piping refers to all pipe, fittings, material and appurtenances required to construct PVC sewer pipe complete, in place.

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Granular fill materials are included in Section 02230.

C. Pavement repair and resurfacing are included in Section 02576.

D. Precast concrete manholes and catch basins are included in Section 02605.

E. Testing and cleaning of pipes is included in Section 02610.

F. Connection to and Work on Existing System is included in Section 02658.

G. Loaming and seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, and within 7 days of the Effective Date of the Agreement, the name of the pipe and fitting manufacturers and a list of materials to be furnished by each manufacturer for the materials to be used in the Marginal Sewer Relief project.

B. Shop Drawings including piping layouts and schedules shall include dimensioning, fittings, types and locations of valves and appurtenances, joint details, methods and location of supports, anchorage, gasket material, grade of material and all other pertinent technical information for all items to be furnished.

C. Prior to each shipment of pipe, certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM Standards specified herein shall be submitted.

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1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

2. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

3. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

4. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

5. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

6. ASTM F679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

B. National Sanitation Foundation (NSF)

1. Standard No. 14 - Plastic Piping Components and Related Materials.

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

1.05 QUALITY ASSURANCE

A. All PVC sewer pipe, drain pipe and fittings shall be from a single manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034 as applicable. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe, will be borne by the Owner. Reference is made to Article 14.07 of the Supplementary Conditions for excessive plant inspection costs.

B. Inspections of the pipe may also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

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1.06 SYSTEM DESCRIPTION

A. The equipment and materials specified herein are intended to be of standard types for use in transporting sewage, storm water and for use as drain pipe.

B. Note information in pipe schedule on Drawings, if any and in this Section, especially concerning pressures, minimum thickness, etc. In case of a conflict, information given in the pipe schedule shall govern.

C. Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.

1.07 DELIVERY, STORAGE AND HANDLING

A. All items shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.

B. PVC items deteriorate in sunlight and are slightly brittle, especially at lower temperatures, so care shall be taken in loading, transporting and unloading items to prevent injury to the items. All items shall be examined before installation and no piece shall be installed which is found to be defective. Handling and installation of pipe and fittings shall be in accordance with the manufacturer's instructions, referenced standards and as specified herein.

C. Any pipe or fitting showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

D. While stored, pipe shall be adequately supported from below at not more than 3-ft intervals to prevent deformation. The pipe shall be stored in stacks no higher than that given in the following table:

Pipe Diameter (inches)	Max. No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2
54 and larger	1

E. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures and out of the sunlight or delivered to the site so that no pipe is exposed to sunlight for more than 30 days. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup or direct or indirect sunlight will not be permitted.

F. If any defective item is discovered after it has been installed, it shall be removed and replaced with an exact replacement item in a satisfactory manner by the Contractor, at the Contractor's own expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until testing.

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G. In handling the items, use special devices and methods as required to achieve the results specified herein. No uncushioned devices shall be used in handling the item.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC solid wall gravity pipe and fittings shall be Type PSM, PVC SDR 35 with full diameter dimensions and shall conform to ASTM D3034 or ASTM F1760, for sizes 4 through 15-in and shall conform to ASTM F679 for sizes 18 through 27-in. Straight pipe shall be furnished in lengths according to ASTM D3034 and wyes shall be furnished in lengths of not more than 3-ft. Saddle wyes will not be allowed.

B. PVC pipe and fittings shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477, ASTM D3139 or ASTM D3212.

C. All fittings and accessories for sewers and drains shall have bell and/or spigot configurations compatible with the pipe.

D. Flexible sleeve type coupling to connect different pipe types, shall be of corrosion resistant rubber or PVC with Series 300 stainless steel clamp bands. Flexible sleeve type couplings shall be as manufactured by Fernco, Mission Rubber Company, Inc., Calder, or equal. All stainless steel bands shall be coated with bitumastic.

E. Perforated polyvinyl chloride pipe shall be Type PS-46 PVC and conform to ASTM F758. Perforated pipe shall be furnished in lengths according to ASTM D3034.

F. Alternatively, perforated polyvinyl chloride pipe shall conform to ASTM D3034 or ASTM 1760 in sizes 4 through 15-in. Perforations shall be two rows of 1/2-in diameter holes spread longitudinally, 6-in (maximum) apart and shall be oriented 120 degrees apart (60 degrees either side of the pipe bottom). A maximum tolerance of 1/4 –in on hole spacing and size will be allowed. The top of pipe shall be marked for ease of installation.

G. Pipe and fittings for perforated pipe shall be bell and spigot push-on joints meeting the applicable requirements of ASTM D3212, except that internal pressure test and vacuum test are not required. Fittings shall be solid wall.

PART 3 EXECUTION

3.01 INSTALLATION OF PVC PIPE AND FITTINGS

A. No single piece of pipe shall be laid unless it is 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-in per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.

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B. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when laid, shall conform to the lines and grades required. PVC pipe and fittings shall be installed in accordance with requirements of the manufacturer, ASTM D2321 or as otherwise provided herein.

C. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Bedding shall then be placed to 12-in above the top of the pipe. The initial 3-ft of backfill above the bedding shall be placed in 1-ft layers and carefully compacted. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial 3-ft of backfill shall be approved by the pipe manufacturer's representative prior to use.

D. All piping shall be sound and clean before installation. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by manufacturer. Fittings, in addition to those shown on the Drawings, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench.

E. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end.

F. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.

G. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped".

H. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

I. Precautions shall be taken to prevent flotation of the pipe in the trench.

J. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. If trench boxes, moveable sheeting, shoring or plates have been installed below the top

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of the pipe, they shall be moved slowly taking care not to disturb pipe, bedding or backfill. As trench boxes, moveable sheeting, shoring or plates are moved, pipe bedding shall be placed to fill any voids created and the backfill shall be re-compacted to provide uniform side support for the pipe.

3.02 JOINTING PVC PIPE AND FITTINGS

A. PVC sewer pipe, drain pipe and fittings shall jointed in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe and the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be joined and pushed home with a come-along or by other means. Check that the reference mark on the spigot end is flush with the end of the bell.

B. All manhole connections shall be as shown on the Drawings except that concrete and mortared connections shall be equipped with an integral O-ring or other sealant such that a positive watertight seal is established.

3.03 WYE BRANCHES AND STUBS

A. All fittings shall be furnished by the same manufacturer that furnishes the pipe.

B. Wye branches shall be furnished and installed and capped as shown on the Drawings or in locations directed by the Engineer. Each wye branch shall be provided with a PVC end cap and shall be backed with a piece of wood (2-in by 4-in) that extends to a point 3-ft below the finished ground surface.

C. Ample time shall be given to the Engineer to obtain the exact location of each wye branch and chimneys before it is covered. Wye branches which are covered before the Engineer has had time to obtain their location, shall be exposed so that location measurements can be taken.

D. PVC manhole drops shall be installed as shown on the Drawings. Concrete for encasements shall be 3500 psi as specified. No backfill shall be placed over this concrete within 16 hours of placing.

E. Pipe stubs for manhole connections shall not exceed 3.25-ft in length unless directed otherwise by the Engineer. Install caps where required.

3.04 SERVICE CONNECTIONS

A. Service connections shall be installed at a minimum slope of 2 percent at the locations and to the limits determined by the Engineer in the field. In each case the end shall be connected to the existing sewer services at the property line.

B. Service connections shall be 6-in diameter unless otherwise shown on the Drawings.

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3.05 INSTALLATION OF PIPE REPAIR COUPLINGS

A. Existing sewer pipe shall be excavated with care so no damage to the pipe or existing fittings is caused. Hand digging around the existing pipe may be required to provide a clear opening for repairing or removing and reinstalling new pipe as specified herein.

B. All couplings shall be examined before installation and none shall be installed which are found to be defective.

C. Installation of all couplings shall be in accordance with manufacturer's instructions and as specified herein.

D. Any damage to existing pipe or fittings other than pipe or fittings specifically intended to be removed, replaced or abandoned as part of this Contract shall be repaired by the Contractor as directed by the Engineer. If the Contractor damages existing pipe or fittings through error or for his own convenience he will be directed by the Engineer to repair all damages, in which case the repair work shall be performed at his own expense.

E. Flexible sleeve type couplings shall be installed for connecting new replacement PVC pipe and fittings to existing sewer pipe or service connections made of any pipe material.

F. Flexible sleeve type couplings shall be installed over smooth spigot or cut ends of pipe. If cutting pipe is required, the cutting shall be done by machine or tool specifically intended for the purpose of cutting the type of pipe being worked on. All cutting of pipe shall be at right angles to the axis of the pipe and shall be performed so as to leave a smooth cut.

G. Replacement of existing sewer pipe using flexible couplings shall consist of removing the damaged pipe to the length as required for each spot repair. Use two sleeve type couplings to connect replacement pipe with plain or cut ends to two existing plain or cut end pipes.

3.06 TESTING (GRAVITY PIPELINES)

A. Testing and cleaning of pipe shall be as specified in Section 02610 and as follows.

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 or drain not passing the mandrel shall be uncovered at no additional cost to the Owner and the bedding and backfill replaced to prevent excessive deflection. Repaired pipe shall be retested at no additional cost to the Owner.

END OF SECTION

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SECTION 02640

VALVES, HYDRANTS AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation and test all valves and appurtenances as shown on the Drawings and as specified herein.

B. The equipment shall include, but not be limited to, the items listed below. However, all items specified herein may not be included in this project.

1. Gate Valves

2. Hydrants

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Granular fill material is included in Section 02230.

C. Pavement Repair and Resurfacing is included in Section 02576.

D. Water Main Testing and Cleaning is included in Section 02611.

E. Reinforced Concrete Drain and Sewer Pipe is included in Section 02612.

F. Ductile iron pipe is included in Section 02616.

G. Water Services and Repairs is included in Section 02725.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, materials required to establish compliance with this Section for shop drawings. Submittals shall include at least the following:

1. Manufacturer's literature, illustrations, specifications and engineering data including:

a. Dimensions.

b. Size.

c. Materials of construction.

d. Weight.

e. Protection coating.

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B. Test Reports

1. Four copies of all certified shop test results specified herein.

C. Operation and Maintenance Manuals

1. Submit complete operation and maintenance manuals including copies of all approved Shop Drawings.

D. Certificates

1. Certificates of compliance where required by referenced standards: For each valve specified to be manufactured and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

E. Submittals shall be made within 7 days of the Effective Date of the Agreement for the Marginal Sewer Relief project.

1.04 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Water Works Association (AWWA)

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings.

2. AWWA C500 - Metal-Seated Gate Valves, for Water Supply Service.

3. AWWA C504 - Rubber-Seated Butterfly Valves.

4. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.

C. American National Standards Institute (ANSI)

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

D. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings

3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

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5. ASTM A536 - Standard Specification for Ductile Iron Castings.

6. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

7. ASTM A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.

8. ASTM A746 – Standard Specification for Ductile Iron gravity sewer pipe.

9. ASTM C150 - Standard Specification for Portland cement.

E. Steel Structures Painting Council (SSPC)

1. SSPC SP-6 - Joint Surface Standard Commercial Blast Cleaning

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

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Valves and appurtenances provided under this Section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service for at least 5 years. If required, the manufacturer shall furnish evidence of installation in satisfactory operation.

2. All units of the same type shall be the product of one manufacturer.

B. Design Criteria

1. All valves and appurtenances shall be new and in perfect working condition. Valves shall be designed for continuous use with a minimum of maintenance and service required and shall perform the required function without exceeding the safe limits for stress, strain or vibration. In no case will used or damaged valves be acceptable. The selection of equipment to meet the specified design conditions is the responsibility of the Contractor. Both workmanship and material shall be of the very best quality and shall be entirely suitable for the service conditions specified.

C. Source Quality Control

1. Valves shall be shop tested in accordance with the following:

a. Gate valves: AWWA C500.

2. Obtain each type of valve from no more than one manufacturer.

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1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the work.

B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.

C. Furnish covers for all openings.

1. All valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.

D. Store equipment to permit easy access for inspection and identification. Any corrosion in evidence at the time of Owner acceptance shall be removed, or the valve shall be removed from the job.

E. Store all equipment in covered storage off the ground.

1.07 COORDINATION

A. Review installation procedures under other Sections and coordinate with the work which is related to this Section including buried piping installation.

B. Coordinate the location and placement of concrete thrust blocks when required.

PART 2 PRODUCTS

2.01 GENERAL

A. All buried valves shall OPEN RIGHT (CLOCKWISE).

B. The use of a manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

C. Valves shall be of the size shown on the Drawings or as noted and as far as possible equipment of the same type shall be identical and from one manufacturer.

D. Valves shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard to which they are manufactured cast in raised letters on some appropriate part of the body.

E. Unless otherwise noted, valves shall have a minimum working pressure of 250 psi or be of the same working pressure as the pipe they connect to, whichever is higher, and suitable for the pressures noted where they are installed.

F. Valves shall be of the same nominal diameter as the pipe or fittings they are connected to. Except as otherwise noted, joints shall be mechanical joints, with joint restraint where the adjacent piping is required to be restrained.

G. Valves shall be especially constructed for buried service.

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2.02 VALVE BOXES

A. All gate valves shall be provided with extension shafts, operating nuts and valve boxes as follows:

1. Extension shafts shall be Type 304 stainless steel and the operating nut shall be 2-in square. Shafts shall be designed to provide a factor of safety of not less than four. Operating nuts shall be pinned to the shafts.

2. Top of the operating nut shall be located 2-in below the rim of the valve box.

3. Valve boxes shall be as manufactured by Clow; Mueller; Tyler; Bailey or equal and shall be a heavy-pattern cast iron, three-piece, telescoping type box with dome base suitable for installation on the buried valves. Inside diameter shall be at least 4-1/2-in. Barrel length shall be adapted to the depth of cover, with a lap of at least 6-in when in the most extended position. Covers shall be cast iron with integrally-cast direction-to- open arrow. Aluminum or plastic are not acceptable. A means of lateral support for the valve extension shafts shall be provided in the top portion of the valve box.

4. The upper section of each box shall have a top flange of sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve and shall be oval.

5. An approved operating key or wrench shall be furnished.

6. All fasteners shall be Type 304 stainless steel.

2.03 GATE VALVES

A. Gate Valves shall be Resilient Seated.

B. All gate valves shall be spray coated with a two-component epoxy to cover all ferrous surfaces that come in contact with water. The constituents of the cured film shall be non-hygroscopic, non-potable and FDA approved for exposure to fluids for human consumption Application of the coating shall be made before any visible oxidation takes place. The coating shall be applied to a minimum thickness of 8 mils. All holidays in the coating shall be repaired by the application of another coat of epoxy over the area. The body and ferrous vane shall then be 100% checked on the water wetted surfaces to be electronically void-free. Abrasion resistance of the final coating shall not be less than 0.005 gm/1000 cycles per ASTM D1044. Certificates of compliance covering the coating shall be submitted and approved before installation of any valve. The certificate of compliance shall include the methods and procedures used for the electronic-free void-free testing and the method used to clean the valve before the epoxy application. The epoxy coating shall be factory applied before valve testing.

C. Gate valves 6-in and larger

1. 250 psig working pressure.

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a. Buried valves shall have nonrising stems, mechanical joint ends and 2-in square operating nuts. Valves shall be furnished with O-ring seals.

b. Gate valves shall be mechanical joint, ANSI Standard 21.11 except where otherwise shown.

c. Furnish valves and accessories as manufactured by Mueller or approved equal.

2.04 RESILIENT SEATED GATE VALVES

A. Valves shall be manufactured in the USA and be in accordance with AWWA C509, by Mueller as specified herein.

B. Valve body and bonnet shall be of cast or ductile iron coated on all exterior and interior surfaces with a fusion bonded epoxy conforming to the latest revision of AWWA standard C-550, applied with a minimum thickness of eight (8) mils. Manufacturer shall certify that the coating is compatible for use in a potable water system and the interior coating certified to be holiday-free. The gate shall be ductile iron casting encased in a bonded-in-place nitrite elastomer covering which forms the resilient seating surfaces. Valves shall be provided with a minimum of two O-ring stem seals. The O-ring stem seals shall be replaceable with the valve under full pressure in the full open position. Valves shall be full port opening, open to the right (clockwise) and be the non-rising stem type with standard accessories for buried application.

C. Valves shall have a minimum design working pressure of 250 psig and a minimum test pressure of 400 psi. Pressure rating shall be cast on the outside of the valve.

D. Bonnet and gland bolts and nuts shall be either fabricated from a low alloy-steel for corrosion resistance or electroplated with zinc or cadmium. The hot-dip process in accordance with ASTM A153 is not acceptable.

E. Wedges shall be totally encapsulated.

F. Units shall be, in addition, UL and FM approved.

2.05 FIRE HYDRANTS

A. Fire hydrants shall be dry-barrel type conforming to the requirements of AWWA C502. Hydrants shall be designed such that the hydrant valve closes with line pressure preventing loss of water and consequent flooding in the event of traffic damage. Hydrants shall be as manufactured by Kennedy (Guardian), or approved equal.

B. Hydrants shall have an automatic drain that is operated by the main valve rod and shall have two drain ports in the shoe of the hydrant. These drain ports shall be brass lined to prevent corrosion.

C. Hydrants shall have a minimum barrel diameter of 6-inches.

D. Hydrants shall have 6-in mechanical joint inlet connections, two 2-1/2-in hose connections and one 4-1/2-in pumper connection. Threads for the hose and pumper connections shall be in accordance with National Standard Thread. Hydrants shall be according to manufacturer's

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standard pattern. Hydrants shall be equipped with O-ring packing. Each nozzle cap shall be provided with a Buna-N rubber washer.

E. Hydrants shall be so arranged that the direction of outlets may be turned 90 degrees without interference with the drip mechanism or obstructing the discharge from any outlet.

F. A bronze or rustproof steel nut and check nut shall be provided to hold the main hydrant valve on its stem.

G. Hydrant valve opening shall have an area at least equal to that area of a 5-1/4-in minimum diameter circle and be obstructed only by the valve rod. Each hydrant shall be able to deliver 500 gallons minimum through its two 2-1/2-in hose nozzles when opened together with a loss of not more than 2 psi in the hydrant.

H. Hydrants shall be designed for installation in a trench that will provide minimum cover as noted on Drawings. Hydrant extensions shall be as manufactured by the company furnishing the hydrants and of a style appropriate for the hydrants as furnished.

I. Hydrants shall open by turning operating nut to right (clockwise) and shall be marked with a raised arrow and the work "open" to indicate the direction to turn stem to open hydrant.

J. Hydrants shall be furnished with caps, double galvanized steel hose cap chain, galvanized steel pumper hose cap chain, a galvanized steel chain holder and any other hooks and/or appurtenances required for proper use.

K. Hydrant operating nut shall be AWWA Standard pentagonal type measuring 1-1/2-in point to flat.

L. Hydrants shall be hydrostatically tested as specified in AWWA C502.

M. All iron work to be set below ground, after being thoroughly cleaned, shall be painted with two coats of asphalt varnish specified in AWWA C502. Iron work to be left above ground shall be shop painted with two coats of paint of quality [and color to correspond to the present standard of the Owner].

2.06 CORPORATION STOPS

A. Corporation stops shall be brass with Mueller-type threads, not less than 1-in in diameter and shall be installed where shown, specified or required.

B. Furnish corporation stops as manufactured by the following:

1. Mueller Company, Figure H-10003.

2.07 CURB STOPS

A. Curb stops shall be bronze with copper fittings and shall be of the inverted key type with base cap and stops.

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B. Curb stops shall be furnished with curb boxes manufactured in US, type 94 E Buffalo Boxes with hex nut cap and a bury depth to suit conditions. The cover shall have the word "WATER" cast into it. Curb boxes shall be Mueller, Figure H-10314 and shall be provided with lid, foot piece and one operating key.

2.08 SURFACE PREPARATION AND SHOP COATINGS

A. The interior ferrous metal surfaces, except finished or bearing surfaces, shall be blast cleaned in accordance with SSPC SP-10.

B. Exterior ferrous metal surfaces of all buried valves and hydrants shall be blast cleaned in accordance with SSPC SP-6 and given two shop coats of an approved two-component coal tar epoxy paint.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

A. During installation of all valves and appurtenances, verify that all items are clean, free of defects in material and workmanship and function properly.

B. All valves shall be closed and kept closed until otherwise directed by the Engineer.

3.02 INSTALLATION OF BURIED VALVES AND VALVE BOXES

A. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve.

B. Before backfilling, all exposed portions of any bolts shall be coated with two coats of bituminous paint.

3.03 INSTALLATION OF FIRE HYDRANTS

A. Fire hydrants shall be set at the locations as shown on the Drawings and bedded on a firm foundation. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing pipe. A drainage pit as detailed on the Drawings shall be filled with screened gravel and compacted. The hydrants shall be set upon a slab of concrete not less than 4-in thick and 15-in square. During backfilling, additional screened gravel shall be brought up around and 6-in over the drain port. Each hydrant shall be set in true vertical alignment and properly braced.

B. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the Drawings. Felt roofing paper shall be placed around hydrant elbow before placing concrete. Care shall be taken to ensure that concrete does not plug the drain ports.

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C. The hydrant shall be tied to the pipe with suitable rods or clamps, galvanized, painted, or otherwise rustproof treated. Hydrant paint shall be touched up as required after installation.

D. Fire hydrants shall be painted in accordance with Owner's standard practice.

3.04 FIELD TESTS AND ADJUSTMENTS

A. Conduct a functional field test of each valve in the presence of Engineer to demonstrate that each part and all components together function correctly. All testing equipment required shall be furnished by the Contractor.

3.05 MANUFACTURER'S SERVICE

A. Furnish the services of a qualified representative of the tapping equipment manufacturer to provide on-site instruction during wet tapping of the existing water mains indicated on the Drawings.

B. In the event of equipment malfunction, the representative of the respective manufacturer shall visit the site as often as necessary until all malfunctions are corrected and the installation is entirely satisfactory.

END OF SECTION

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SECTION 02651

TELEVISION INSPECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Each new gravity pipe section shall be visually inspected by means of closed-circuit television. The inspection shall be done one sewer line section (i.e. manhole to manhole) at a time and the section being inspected shall be suitably isolated from the remainder of the sewer system as required.

B. Video recordings shall be made of the television inspections and copies of both the DVD recordings and printed inspection logs shall be supplied to the Engineer for his inspection and the Owner's file.

1.02 RELATED WORK

A. New Gravity Pipeline Testing and Cleaning is included in Section 02610.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions. The television camera shall be equipped with a pan and tilt head. The camera, television monitor and other components of the video system shall be capable of producing a minimum 500-line resolution video picture. Picture quality and definition shall be to the satisfaction of the Engineer and if unsatisfactory, equipment shall be removed and no payment made for an unsatisfactory inspection.

B. All television work shall be recorded in DVD format as the work is being conducted.

PART 3 EXECUTION

3.01 PROCEDURE

A. The camera shall be moved through the line in either direction at a uniform rate, stopping when necessary to ensure proper documentation of the sewer's condition but in no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire sewer line section, the equipment shall be removed and repositioned in a manner so that the inspection can be performed from the opposite manhole. If, again, the camera

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fails to pass through the entire sewer line section, the Contractor shall remove the obstruction by excavation and replacement of that section of pipe as directed by the Engineer.

B. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones, radios, or other suitable means of communication shall be set up between the two manholes of the sewer line being inspected to ensure that good communications exist between members of the crew.

C. The accuracy of the measurements cannot be stressed too strongly. Measurement for location of defects shall be below ground by means of a meter device. Marking on cable, or the like, which would require interpolation for depth of manhole, shall not be allowed. Measurement meters shall be accurate to two-tenths of a foot over the length of the sewer line section being inspected. Accuracy of the measurement meters shall be checked daily above ground by use of a walking meter, roll-a-tape, or other suitable device.

3.02 RECORDING OF FIELD OBSERVATIONS

A. Television Inspection logs

1. Printed location records shall be kept which shall clearly show the locations of building and house service connections and other discernible features shall be recorded and a copy of such records shall be supplied to both the Owner and the Engineer.

B. Photographs

1. Instant developing, 35 mm, or other standard size photographs of the television monitor of problem areas shall be taken as directed to document questionable conditions found during the course of the work.

3.03 RECORDING OF TELEVISION INSPECTIONS

A. General

1. The Contractor shall submit to the Engineer, two copies of digital recordings (images and video) of the pipeline television inspections and summary data in DVDR format. The label shall correspond to a schedule of every sewer reach contained on the CDR.

2. The digital recordings shall be in accordance with NASSCO PACP and linked to Granite XP software capable of performing multiple summaries, queries, and analysis. The software shall also have the capability of recording, digitizing and storing single frames of video images and full time live video, as well as collecting, storing and printing pipe line inspection data for display and report generation.

3. Video Capture

a. Full time live color video and audio files shall be captured for each pipe inspected. The files shall be stored in industry standard MPEG (Moving Pictures Expert Group) format and can be transferable by DVDR to an external personal computer that utilizes standard MPEG viewers. The MPEG video shall be defined as ISO-MPEG Level 1 (MPEG-1) coding with a resolution of 352-pixel (x) by 240-pixel (y) and an encoded frame rate of

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29.97 frames per second. The recordings shall identify the location both within the pipe segment (physical location) and within the digital recording (video frame location) for each defect or observation. Video recording shall be at the same speed that it was recorded.

b. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording. A user defined, pipeline search mechanism shall be provided.

c. The video inspection shall include segment information (start and ending manholes, station footage, date, time, client, address, etc.). A pointer shall be provided from each observation to the digital recording and any accompanying digital still images.

END OF SECTION

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SECTION 02656

TEMPORARY WATER BY-PASS AND SERVICES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install and remove by-pass and temporary service pipe and fire hydrants of the sizes required to provide adequate service to all water consumers whose service will be interrupted by new water main installation and to fulfill fire service requirements. Existing fire hydrants connected to pipe being replaced and serving as temporary fire hydrants shall be connected to the temporary pipe at locations directed by Lowell Regional Water Utility (LRWU).

B. In cases where access to the building water meter is not possible or where temporary service connection using hoses would not provide adequate supply capacity a temporary service connection shall be made to the existing service pipe in the street between the corporation cock at the main and the curb stop, or in the sidewalk area between the curb stop and the service shut off valves inside the building.

C. The work of relocating existing service and of furnishing and installing temporary service pipe, temporary customer services and other branches, maintaining the same, providing suitable safety precautions and removal of the temporary service pipe system shall be the sole responsibility and expense of the Contractor.

D. <u>No interruption in water service or fire protection shall be permitted during water main construction or by-pass installation/removal</u>. Temporary by-pass water mains, at a minimum, must be connected to the existing distribution system at both ends to maintain continuity in the distribution system. "Dead-ending" of the by-pass system is not permitted. The contractor shall take necessary measures, including tapping existing water mains and installing gate valves when existing hydrants and existing gate valves are unavailable for use, to assure continuous water service and fire protection when developing the by-pass water main/service plan.

1.02 RELATED WORK

A. Water Main Testing and Cleaning are included in Section 02611.

B. Ductile Iron Pipe and Fittings are included in Section 02616.

C. Valves and Appurtenances are included in Section 02640.

D. Water Services and Repairs are included in Section 02725.

1.03 SUBMITTALS

A. Prior to any construction activity, the Contractor shall submit to the Engineer for approval a plan and schedule of his proposed temporary by-pass water main/service connections. This plan shall

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be submitted on a clean set of project drawings and temporary service pipe layout shall be consistent with sequence of operations. The submittal shall include:

1. A plan showing the layout of temporary water mains including: connections to existing hydrants, taps to temporary mains at street crossings, installing gate valves, large driveways, etc., existing water main valves to be operated, and location of by-pass hydrants and valves.

2. A description of the by-pass water main/service connection installation for each street required.

3. A daily schedule of by-pass installation events for each street including: notification of residents, by-pass main installation and disinfection, laboratory analysis of by-pass water service installation, etc.

4. A list of spare parts stored on site for maintenance and repairs to temporary by-pass and service connections.

B. Submittals shall be made within 7 days of the Effective Date of the Agreement.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

B. American Water Works Association (AWWA)

1. AWWA C651 - Disinfecting Water Mains.

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

PART 2 PRODUCTS

2.01 GENERAL:

A. All materials to be used for the by-pass shall meet the requirements of the specifications under other Sections.

2.02 TEMPORARY BY-PASS WATER MAIN

A. Temporary by-pass water main and fittings shall be constructed of high density polyethylene pipe or PVC pipe, with joint coupling, of sufficient strength to meet applied load and working pressure. A minimum of 4-inch overland temporary pipe shall be used.

B. Corporation cocks, curb stops, copper tubing, curb boxes, corporation adapters and compression couplings for brass or copper pipe shall be as specified in Section 02725.

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2.03 TEMPORARY WATER SERVICE CONNECITONS

A. Temporary water service connections shall be a minimum ¾" polyethylene or copper tubing.

PART 3 EXECUTION

3.01 GENERAL:

A. The Contractor shall furnish and install temporary by-pass water main, temporary hydrants, temporary in-line gate valves, temporary house service connections and permanent gate valves prior to water main replacement construction.

B. The by-pass pipes shall be supplied from connections made to hydrants or existing water mains (through 2" and 4" diameter taps) that are to remain in service. The Contractor shall furnish all fittings and make all necessary connections required to supply the by-pass pipes (including services) with water, including approved corporation stops, tapped saddles, and plugs at dead end mains.

C. All temporary piping shall be suitably valved and meet the approval of the LRWU and Engineer. A valve shall be provided at each hydrant connection and each tap hole connection. Valves shall be located no further than 500 feet apart. Additional valves shall be placed where directed by LRWU.

D. The Contractor shall also furnish, install, maintain, and remove service hoses or pipes, of approved size, to service all consumers from gated connections on the bypass pipe. The Contractor shall make the actual connection and disconnection of his work and shall contact (with written notice) and coordinate with the owner of any building to be serviced so that there will be the least amount of inconvenience to the owners. Written notices shall be submitted to the Engineer for approval prior to distributing to property owners. No separate payment will be made for tapping existing fire or service line for purposes of supplying temporary water service.

E. Temporary by-pass pipe and other materials shall provide adequate water tightness, and care shall be exercised throughout the installation of the temporary pipe and making up of all temporary connections to avoid any possible pollution of any City water mains or house services or contamination of the temporary by-pass pipe itself. The Contractor shall flush and disinfect ALL temporary pipe and hose to prevent contamination in accordance with AWWA Standard C651 (latest revision).

F. In general, the temporary by-pass pipe shall be laid within street lines in locations satisfactory to the Engineer where it will cause the least obstruction and will be least likely to be damaged. At driveways, provision shall be made to permit property owners to drive over the temporary pipe by the use of temporary bituminous pavement, cold patch, or other approved material to form a ramp on each side of the pipe to the satisfaction of the Engineer or by depressing the pipe as at street crossings. In some areas, because the by-pass and/or service pipe or hoses may be considered an obstruction to safe passage, additional precautions shall be taken by the Contractor to minimize public inconvenience. This will require additional ramping on both sides of the by-pass pipe at building walkway entrances, at all sidewalk crossings, and elsewhere.

G. At street crossings, a narrow trench shall be cut in the existing pavement sufficiently wide and deep enough to allow placement of the by-pass pipe just below the roadway surface with

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temporary surfacing placed above it, compacted by approved means, flush with the adjacent pavement. Allowing the temporary surfacing to be compacted by vehicular traffic is not to be considered as an approved method. Upon removal of the by-pass piping, the trench shall be backfilled with suitable material, properly compacted, and restored to service with a permanent wearing surface. No separate payment will be made for this work.

H. In all cases, the location, method of placing, materials employed, and the sanitary precautions shall be fully satisfactory to the Engineer.

I. Once put in use, the temporary service pipe shall be maintained by the Contractor 24 hrs/day, 7 days/week until the water main is restored to service. Any interruptions, whether caused by frost, physical damage, or otherwise, shall be immediately corrected and the service restored or replaced without additional payment.

J. The Contractor shall complete all sections of the project in progress before the daily low temperature falls below 35 degrees Fahrenheit. The Contractor is responsible for maintaining all components of the by-pass system impacted by freezing conditions, including service connections and shall take reasonable measures when scheduling work as cold weather season approaches. Should it become necessary to stop work and remove the by-pass system due to freezing conditions, separate payment shall not be made to re-install, chlorinate and test the by-pass system.

K. After the water mains have been replaced and new water mains put into service, all temporary by-pass and service lines must be removed without delay and all bituminous patching required by such temporary lines shall be applied at this time.

END OF SECTION

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SECTION 02658

CONNECTIONS TO AND WORK ON THE EXISTING GRAVITY SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and maintain flow in existing sewers, force mains, and drains, handle existing sewer and drain flow, construct and maintain all temporary connections and bypasses and construct the permanent connections to the new system as shown on the Drawings and as directed by the Engineer.

B. Furnish all labor, materials, equipment required and plug existing drains or sewers, all work on existing manholes (including all work and materials required to reshape existing manhole inverts with brick or concrete and connecting new drain pipes to existing manholes or drain pipes) and all additional work required.

C. Should damage of any kind occur to the existing drain or sewer, at the Contractor's own expense and as part of the work under this Item, make repairs to the satisfaction of the Engineer.

D. Notify the Engineer immediately of any discrepancies in elevations of existing drains, sewers and manholes between those shown on the Drawings and those established during construction in order that the Engineer can make the necessary modifications.

E. All new drain pipes for connection shall conform to Sections 02612, 02616, or 02622.

1.02 RELATED WORK

A. Maintenance of flow in sewer and drains is included in Section 01510.

B. Excavation, backfilling and compaction are included in Section 02221.

C. Precast Concrete manholes and catch basins are specified in Section 02605.

D. Miscellaneous work and cleanup is specified in Section 02901.

E. Concrete is specified in Section 03301.

1.03 SUBMITTALS

A. Shop drawings, product data, materials of construction and details of installation for all replacement pipe shall be submitted in accordance with Section 01300.

PART 2 PRODUCTS (NOT USED)

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PART 3 EXECUTION

3.01 HANDLING WASTEWATER FLOWS

A. Furnish all labor, equipment and materials necessary to maintain existing flows, including temporary bypasses and all pumping of wastewater and drainage that may be required to prevent backing up of sewers and drains and shall immediately cart away and remove all offensive matter at Contractor's own expense.

B. Furnish all labor, equipment and materials necessary to maintain existing drain, sewer and sewer service connection flows, including temporary by passes and all pumping of wastewater and drainage that may be required to prevent backing up of systems.

C. Permission will not be given to overflow, bypass, pump or by any other means convey drainage to any brook, or other water course without permission of the Engineer.

D. All procedures for maintaining flows must meet the approval of the Engineer and submit to the Engineer, for approval, a detailed written plan of all methods of flow maintenance 10 days in advance of flow interruption.

E. Provisions shall be made by the Contractor to maintain water and sewer service connections during construction. Any damaged service connection shall be replaced from the main pipeline to a minimum of three (3) feet beyond the point of damage.

3.02 PLUGGING AND ABANDONING FACILITIES

A. In areas where pipes are removed from the existing sewer manholes, drain manholes or catch basins, the point of connection shall be repaired with brick, mortar and non-shrink grout to the satisfaction of the Engineer. Where direct connections to the combined sewer are abandoned, the connection must be sealed from within the combined sewer. This shall be done by removing catch basin connections from the existing pipe and repairing the pipe section with flexible transition couplings and SDR 35 PVC sewer pipe as detailed on the Drawings. The repair shall extend a minimum 18-in beyond each side of the opening.

B. All abandoned pipes shall be plugged and filled with Controlled Density Fill or sand blown in under pressure as directed by the Engineer.

END OF SECTION

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SECTION 02725

WATER SERVICE CONNECTIONS AND REPAIRS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to make new house service connections to the property line and in making repairs to house service connections damaged by construction or where directed by the Engineer. Furnish all necessary labor and equipment to excavate the trenches from the main to the property line, backfill the trenches after the new connection is completed and restore the street and sidewalk to their original condition. Trench excavation and backfilling shall be done in accordance with all of the related Sections.

B. Corporation cocks shall be installed for connecting all service to the new water mains. Keep a record of the locations of all corporation cocks installed and shall indicate on the record those corporation cocks that have not been connected to service piping. A copy of this record shall be given to the Engineer at the completion of the work. Copper tubing, curb stops and necessary adapters shall be used to make connections between new corporation cocks and new and existing service piping. Unless otherwise directed, the new curb stops shall be located 1.5-ft back of the curb line. Be responsible for the removal and/or installation of curb stops in the locations directed by the Engineer.

C. All existing services shall be maintained until the new service connections have been fully installed, chlorinated and tested to the satisfaction of the Engineer. All service connections shall then be made to the mains as specified below. Connect each existing house service to the new service connections provided after the completed installation has been accepted by the Engineer. All abandoned services shall have ends crimped.

1.02 RELATED WORK

A. Excavation, backfilling, and compaction are included in Section 02221.

B. Granular materials are included in Section 02230.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, within 7 days after signing the contract a list of materials to be furnished, the name of suppliers and the date of delivery of materials on the job site for the Marginal Sewer Relief project.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

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B. American Water Works Association (AWWA)

1. AWWA C800 - Underground Service Line Valves and Fittings.

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

PART 2 PRODUCTS

2.01 MATERIALS

A. Service pipe shall be soft, annealed seamless copper tubing conforming to ASTM B88, Type K. The name and trademark of the manufacturer shall be stamped along the pipe.

B. Corporation stops for service connections shall be Ford or Mueller or approved equal, with CC thread inlet and compression ball outlet. Bronze with lapped ground Key, with 1” CC x 1” Pack Joint or 2” CC x 2” Pack Joint.

C. Curb stops shall be Ford or Mueller or approved equal. Ball curb stops, compression joints on both ends, with drain, open right. Existing 1” copper service shall be 1” Pack Joint x 1” Pack Joint. Existing 1” iron pipe service shall be 1” Pack Joint x 1” Iron Pipe/Pack Joint. Existing 1” lead service shall be 1” Pack Joint x 1” Pack Joint. Existing 2” copper service shall be 2” Pack Joint x 2” Pack Joint. Existing 2” iron pipe service shall be 2” Pack Joint x 2” Iron Pipe/Pack Joint. Existing 2” lead service shall be 2” Pack Joint x 2” Pack Joint.

D. Service boxes shall be manufactured in the United States, type 94 E buffalo box with hex nut cap, bury depth to suit conditions, “WATER” cast in cover.

E. Adapter couplings for connecting new copper tubing to existing service connection at the property line shall be standard straight coupling fittings conforming to AWWA C800; by Mueller or approved equal.

F. Line fittings, if required on new service line, shall be standard three-part unions conforming to AWWA C800; Mueller or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Corporation cocks. The tapping machine shall be rigidly fastened to the pipe as near the horizontal diameter as possible. The length of travel of the tap should be so established that when the stop is inserted and tightened with a 14-inch wrench, not more than one to three threads will be exposed on the outside. Use a wet tapping machine so that the corporation cock shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to give water tightness and care must be constantly exercised not to over tighten them.

B. Straight couplings. Install straight couplings to existing water mains of the sizes required in the locations designated by the Engineer in the field. Utilize the manufacturer's recommended installation procedures while performing the work. Care shall be taken to ensure a watertight connection.

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C. Curb stops shall be installed 1.5-ft from the curb line or pavement limit or as directed by Engineer. Install the curb cocks and boxes in a workmanlike manner as described herein and as directed by the Engineer. Place compacted screened gravel around and below the cock to permit ready draining of the pipe through the waste opening.

D. The boxes shall be set in a true vertical position and shall not be installed within the limits of the roadway. The boxes should be set where they are not likely to be disturbed and the tops shall be set flush with the adjoining ground.

E. Copper tubing. Care shall be exercised in the placing and laying of copper tubing to be sure that the pipe does not have kinks or sharp bends and to assure against it being in contact with sharp stones or ledge which would cause damage to the pipe. Copper tubing shall be placed on a 6-inch sand bed and covered with a 1-foot sand blanket.

END OF SECTION

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SECTION 02726

SEWER AND DRAIN SERVICE CONNECTIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required for sewer and drain service connection repairs or replacement using polyvinyl chloride (PVC) sewer pipe and fittings, complete as specified herein.

1.02 RELATED WORK

A. Excavation, backfilling and compacting is included in Section 02221.

B. Granular materials are included in Section 02230.

C. Pavement repair and resurfacing are included in Section 02576.

D. Polyvinyl Chloride (PVC) pipe is included in Section 02622.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and schedules of all PVC pipe, fittings and couplings required.

B. Submittals shall be made within 7 days of the Effective Date of the Agreement for the Marginal Sewer Relief project.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

2. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

3. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers.

4. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

5. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

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6. ASTM F794 - Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

7. ASTM D3189 - Method for Rubber - Evaluation of Solution BR (Polybutadiene Rubber).

8. ASTM F679 – Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

B. National Sanitation Foundation (NSF)

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

1.05 DELIVERY, STORAGE AND HANDLING

A. Care shall be taken in shipping, handling, and laying to avoid damaging the pipe and fittings. Extra care will be necessary during cold weather construction. Any pipe damaged in shipment shall be replaced as directed by the Engineer.

B. Any pipe or fitting showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. While stored, pipe shall be adequately supported from below at not more than 3-ft intervals to prevent deformation.

D. Pipe and fittings shall be stored in a manner that will keep them at ambient outdoor temperatures. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings that allows temperature buildup or direct or indirect sunlight will not be permitted.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 INSTALLATION OF PVC PIPE AND FITTINGS

A. No single piece of pipe shall be laid unless it is 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-in per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.

B. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when laid, shall conform to the lines and grades required. PVC pipe and fittings shall be installed in accordance with requirements of the manufacturer, ASTM D2321 or as otherwise provided herein.

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C. As soon as the excavation is complete to normal grade of the bottom of the trench, crushed stone or crushed stone bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Crushed stone shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the crushed stone or screened gravel under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. The sand cushion shall then be placed to 12-in above the top of the pipe. The initial 3-ft of backfill above the sand cushion backfill shall be placed in 1-ft layers and carefully compacted. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial 3-ft of backfill shall be approved by the pipe manufacturer's representative prior to use.

D. All pipes shall be sound and clean before installation. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by manufacturer. Fittings, in addition to those shown on the Drawings, shall be provided, if required, in crossing utilities that may be encountered upon opening the trench.

E. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end.

F. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.

G. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped".

H. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

I. Precautions shall be taken to prevent flotation of the pipe in the trench.

J. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the crushed stone or screened gravel backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, crushed stone or screened gravel shall be placed to fill any voids created and the crushed stone or screened gravel backfill shall be re-compacted to provide uniform side support for the pipe.

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3.02 FITTINGS, WYE BRANCHES AND STUBS

A. All fittings shall be furnished by the same manufacturer that furnishes the pipe.

B. Wye branches shall be furnished and installed as shown on the Drawings or in locations directed by the Engineer. Each wye branch shall be provided with a PVC end cap for testing where required.

C. Ample time shall be given to the Engineer to obtain the exact location of each wye branch before it is covered. Wye branches that are covered before the Engineer has had time to obtain their location, shall be exposed so that location measurements can be taken.

D. Pipe stubs for manhole connections shall not exceed 3.25-ft in length unless directed otherwise by the Engineer. Install caps where required.

3.03 SERVICE CONNECTIONS

A. Service connections shall be installed at a minimum slope of 2 percent at the locations and to the limits determined by the Engineer in the field. In each case the end shall be connected to the existing sewer service at the property line.

B. Service connections shall be 6-inch diameter unless otherwise shown on the Drawings.

3.04 INSTALLATION OF PIPE REPAIR COUPLINGS

A. Existing sewer pipe shall be excavated with care so no damage to the pipe or existing fittings is caused. Hand digging around the existing pipe may be required to provide a clear opening for repairing or removing and reinstalling new pipe as specified herein.

B. All couplings shall be examined before installation and none shall be installed which are found to be defective.

C. Installation of all couplings shall be in accordance with manufacturer's instructions and as specified herein.

D. Any damage to existing pipe or fittings other than pipe or fittings specifically intended to be removed, replaced or abandoned as part of this Contract shall be repaired by the Contractor as directed by the Engineer. If the Contractor damages existing pipe or fittings through error or for his own convenience he will be directed by the Engineer to repair all damages, in which case the repair work shall be performed at his own expense.

E. Flexible sleeve type couplings shall be installed for connecting new replacement PVC pipe and fittings to existing sewer pipe or service connections made of any pipe material.

F. Flexible sleeve type couplings shall be installed over smooth spigot or cut ends of pipe. If cutting pipe is required, the cutting shall be done by machine or tool specifically intended for the purpose of cutting the type of pipe being worked on. All cutting of pipe shall be at right angles to the axis of the pipe and shall be performed so as to leave a smooth cut.

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G. Replacement of existing sewer pipe using flexible couplings shall consist of removing the damaged pipe to the length as required for each spot repair. Use two sleeve type couplings to connect replacement pipe with plain or cut ends to two existing plain or cut end pipes.

END OF SECTION

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SECTION 02765

SEWER AND DRAIN CLEANING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to clean sewer and drain pipe and fittings installed and/or rehabilitated, complete as shown on the Drawings and as specified herein.

B. Cleaning shall include proper high pressure water jetting, rodding, bucketing, brushing and flushing of sewers, drains and manholes prior to inspection by closed circuit television, pipeline rehabilitation or replacement, point repairs, manhole preparation, and testing operations.

C. Goal of cleaning is to remove debris, roots, intruding services, deposits, and other blockages to a minimum of 95 percent open. Contractor shall perform drain cleaning work to an acceptable level as necessary to perform a thorough television inspection of sewer. If pipe condition is such that cleaning may cause a potential collapse, then pipe shall be televised without attempting to clean it to 95 or 98 percent condition, pending approval by Engineer.

D. Cleaning work for the 42-inch Lowell Connector drain culvert shown on Sheet C-3 shall also include permitting of the cleaning project through the Lowell Conservation Commission including preparation of the Notice of Intent, attendance at a Conservation Commission meeting to present the project, filing of the Order of Conditions, and adherence to the Order of Conditions requirements during the completion of the work.

E. Existing 42-inch Lowell Connector drain culvert is owned by MassDOT. The cleaning work is allowed from both the inlet and outlet of the pipe, pending approval by Lowell Conservation Commission for the Notice of Intent.

F. Temporary construction areas are required to complete the project on MassDOT property but these work areas will outside of the state roadway via an access agreement submitted by the Owner.

   1. Access on the north side of the Lowell Connector will be from an adjacent property.

   2. Temporary access to the culvert outlet area will be required from the Lowell Connector Exit 5A (north/east bound) ramp onto Thorndike Street as shown on the drawings. Access to the MassDOT property is granted per the Application for Access to State Highways (Appendix M).

1.02 RELATED WORK

A. Maintenance of Flow in Existing Sewers and Drains is included in Section 01510.

B. Television Inspection is included in Section 02651.

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1.03 SUBMITTALS

A. Submit a safety plan prior to performing any on-site work that includes the following as a minimum:

1. Confined Space Entry.

2. Personal Protective Equipment.

B. Submit a cleaning plan for the existing 42-inch RCP drain culvert to Owner and the Lowell Conservation Commission for review prior to performing any on-site work that includes the following as a minimum:

1. Cleaning plan shall including cofferdams at outlet location for dewatering or other sediment capture measures.

2. Notice of Intent

C. Closeout Documents: Submit one complete set of documentation regarding inspections and work performed. Based on work scope, submit written reports, photographs taken, and DVDs that incorporated color video recordings.

1.04 QUALITY ASSURANCE

A. Contractor shall have a minimum of five years' experience in sewer line and underground structure cleaning. Submit a list of at least three customers who have had similar work complete. Furnish trained and qualified technicians with proper experience operating equipment that is being used on this project.

1.05 PROJECT/SITE REQUIREMENTS

A. Recording of Field Observations: Record video inspections in color on DVD disk. Submit inspection report in Microsoft Access format database and recorded onto compact discs (CDs). Original recordings and inspection reports shall become property of Owner. Observations shall include:

1. Television Inspection Logs: Each segment inspection shall have a separate inspection report that is recorded onto a CD, in a Microsoft Access or Excel format that shall be given to Owner for its use; also submit a paper copy of the report that is clear and concise to reader. Clearly show location, in relation to adjacent manholes, of each source of infiltration discovered. In addition, other data of significance including locations of building and house service connections, along with an estimation of infiltration from such services, joints, unusual condition, roots, cracked or collapsed sections, presence of scale and corrosion, sewer line sections that the camera failed to pass through and reasons for failure and other discernible features shall be recorded.

2. Photographs: During CCTV inspection, stop camera at significant observations to ensure a clear and focused view of pipe condition. At this point, if video equipment has video printer capabilities for instantaneous photographs, take photographs of significant observations for use in inspection documentation report. If the video equipment does not have capabilities for instantaneous photographs, take digital photographs of monitor with

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significant observations on screen. Provide Owner with a CD that includes all photographs.

3. DVD Recordings: Purpose is to supply a visual and audio record of problem areas of sewer lines that may be replayed both daily and at future presentations by Owner. DVD recording playback shall be at same speed that it was recorded. Slow motion or stop motion playback features shall be supplied at option of the Contractor. Make DVD recordings in color. Have DVD disc and necessary playback equipment readily accessible for review by Owner during the project. At project completion furnish original DVD recordings to the Owner. Contractor shall keep a copy of DVD discs for 30 days after Substantial Completion, at which time DVDs may be erased at Contractor's option.

1.06 DEFINITIONS

A. Light Cleaning: Small amounts of debris existing within sewer line and where sewer reaches do not require heavy cleaning, as defined below, and that produce little or no debris.

B. Heavy Cleaning: Large deposits of debris or heavy root growth existing within sewer line and where sewer reaches require debris removal of depths up to 25 percent of pipe height.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Hydraulic Sewer Cleaning Equipment:

1. 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 cleaning operation to protect against flooding of sewer or drain. Movable dam shall be same diameter as pipe being cleaned and shall provide flexible scraper around outer periphery to ensure total removal of grease. If sewer cleaning balls or other such equipment which cannot be collapsed instantly are used, take special precautions against flooding of sewers and public or private property.

B. High Velocity Jet (Hydrocleaning) Equipment:

1. Have a minimum of 500 feet of high pressure hose.

2. Have a selection of two or more velocity nozzles that are capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned. Also include a high velocity gun for washing and scouring manhole walls and floor.

3. Be capable of producing a minimum of 80 gallons per minute flows from a fine spray to a long distance solid stream and delivering up to 1000 psi. Be able to carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel. Locate controls so equipment can be operated above ground. Select flowrates and pressures as required for each size of sewer, type of debris, and amount of debris, and as recommended by nozzle manufacturers.

4. Have a water tank, auxiliary engines and pumps, and a hydraulically driven hose reel.

5. Have root cutting blades that are hydraulically spun.

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6. Hydrocleaning shall be combined with vacuum methods to minimize sediment discharging to River Meadow Brook.

C. Mechanical Cleaning Equipment:

1. Bucket machines shall be in pairs and with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that 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 feet of rod. Rod shall be specifically treated steel. To ensure safe operation, machine shall have a fully enclosed body and an automatic safety release clutch or relief valve.

PART 3 EXECUTION

3.01 GENERAL

A. Cleaning Precautions: During sewer and drain cleaning operations, satisfactory precautions shall be taken in use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard flow in sewer and drain line are used, precautions shall be taken to ensure that water pressure created does not damage or cause flooding of public or private property being served by sewer and drain. When possible, flow of sewage in sewer shall be utilized to provide necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, water shall be conserved and not used unnecessarily.

B. No sewer or drain cleaning shall take place in a particular pipe segment until upstream pipe segments have been cleaned. If cleaning is done in a downstream pipe segment in order to facilitate overall cleaning operations, segment shall be re-cleaned at no additional cost to Owner, after pipes upstream of that segment have been cleaned.

C. Sewer and drain line walls shall be cleaned adequately to provide for proper operation of joint testing and sealing equipment or internal inspection to discern structural defects, misalignment and infiltration/inflow sources. Cleaning shall be performed immediately prior to joint testing and sealing and internal inspection to preclude build-up of debris from infiltration/inflow sources and discharges from upstream pipeline sections.

D. Water for sewer cleaning shall be purchased by Contractor and obtained at locations in accordance with utility owner. If water is obtained from a potable supply, provide appropriate backflow prevention devices as required by authority having jurisdiction to protect potable system from cross connections and contamination. Contractor shall be solely responsible for preventing cross contamination of any public or private water systems used for this purpose.

3.02 PREPARATION

A. Selection of cleaning equipment shall be based on conditions of sewer or drain lines and manhole at the time the work commences. Equipment and methods selected shall be acceptable to Engineer. Acceptance of proposed method of cleaning does not relieve Contractor of its responsibility to adequately remove dirt, grease, rocks, sand, and other materials and obstructions from sewer or drain lines and manholes to allow performance of other work.

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B. Take satisfactory precautions to protect pipe lines from damage that might be caused by improper use of cleaning equipment. Whenever using hydraulically propelled cleaning tools that depend upon water pressure to provide their cleaning force, or any tools that retard flow of water in pipe line, take precautions to ensure that water does not cause damage or flooding to public or private property.

C. No fire hydrant shall be obstructed in case of a fire in area served by hydrant.

D. Remove water meters, piping, and related equipment from fire hydrants at end of each work day.

3.03 PERFORMANCE

A. Selection of cleaning equipment shall be based on conditions of manholes and sewer or drain lines at the time the work commences based on pre-construction CCTV inspection to be conducted by Contractor.

B. Contractor shall provide appropriate screening to stop passing of materials into downstream sewers. Sludge, dirt, sand, rocks, grease, and other solid or semisolid residue, debris, and material resulting from cleaning operations shall be removed at downstream manhole of section of sewer being cleaned. Passing material from manhole section to manhole section which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment shall not be permitted.

C. Debris, residue, and other materials resulting from cleaning operations shall become property of Contractor and shall be removed from site at end of each workday and shall be disposed at Duck Island WWTF or another approved and lawful manner. Under no circumstances will accumulation of debris, residue, and other matter be permitted on site beyond stated time, unless prior written authorization is given for storage in totally enclosed containers. Coordinate with Owner on disposal of sediment at Duck Island WWTF.

D. Light Cleaning: Use balls, scooters, and 3 passes of high pressure water jetting equipment, brushes and swabs. Costs related to cleaning of such sewers shall be included in Contractor's unit prices for CCTV and Light Cleaning.

E. Heavy cleaning: Use bucket machines, scrapers, and augers with cleaning which requires more than 3 passes with hydraulic cleaning equipment to achieve acceptance results. Heavy cleaning will be conducted only upon approval and direction of Engineer. Costs related to cleaning of such sewers shall be included in Contractor's unit prices for Heavy Cleaning. Costs related to televising of such sewers following heavy cleaning shall be included in Contractor's unit prices for CCTV and Light Cleaning. Compensation for heavy cleaning of a particular line will only be paid if:

1. Heavy cleaning was authorized by Engineer prior to Contractor performance of the work.

2. Contractor proves that both significant time and effort was necessary to clean the line, (i.e. time required to clean and inspect the line must have been at least twice the average time required to clean and inspect other sewers of comparable length and diameter in project area.

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3. Adequate video proof of blockage, debris, grit or grease build-up, or other condition is provided by Contractor. Heavy Cleaning will be paid for on a lineal foot basis only for length required to be cleaned, i.e., from downstream manhole to approximate location of heavy cleaning. This may or may not include entire pipe section, unless otherwise approved by Engineer or Owner.

F. Obtain video proof of heavy cleaning by acquiring a 'before' video of accessible portions of obstructed reach; submit to Engineer along with completed inspection.

1. A submerged camera does not justify a need for heavy cleaning; proof that submergence was due to a blockage or heavy debris and not a sag in the line will be required.

G. Pipes that contain roots or debris depths greater than 25 percent of pipe height may be paid on a time and material basis, upon approval by Engineer. Engineer or Owner may determine any individual pipe be cleaned on a time and material basis.

H. Flushing of sanitary sewers and storm drains to facilitate cleaning activities without the capture of solids and debris is expressly prohibited.

I. Retrieval of equipment lodged in pipes or a wet well is Contractor's responsibility and shall be performed at Contractor's expense.

3.04 FIELD QUALITY CONTROL

A. Acceptance of sewer line cleaning shall be contingent on satisfactory completion of television inspection. If television inspection shows cleaning to be unsatisfactory, sewer line shall be re-cleaned and re-inspected until cleaning is shown to be satisfactory.

B. If internal joint testing and sealing is to follow cleaning, give particular attention to adequacy of cleaning to ensure that proper seating of sealing packer can be achieved.

C. Inspection of cleaning operations will be made on a daily basis by the Engineer.

3.05 CLEANING

A. Upon cleaning of underground sewer lines or structures, removal debris from finish grade and clean work areas so conditions at conclusion of the work are equal to or better than areas prior to work of this Section.

END OF SECTION

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SECTION 02830

CHAIN LINK FENCE

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install the chain link fence and gates as shown on the Drawings and as specified herein.

B. The existing DPW Yard fence shall be removed to facilitate construction and replaced in kind unless otherwise instructed by the DPW and/or Engineer.

1.02 RELATED WORK

A. Earthwork is included in Section 02221

B. Concrete in included in Section 03301

1.03 SUBMITTALS

A. Submit, in accordance with Section [01300], shop drawings showing dimensions layouts and details of construction and accessories required. Submittals shall include the following:

1. Product data including manufacturer's technical data, specifications and installation instructions.

2. Shop drawings showing fence and gate system materials including details of all major components like fence fabric sizes and finish, pipe and fabric gauge, post spacing, footings dimensions, locking mechanism on gates, rails, tension wire, heights, top and bottom fabric wire condition, wire ties, clearance from finished grade to bottom of fences and gates .

1.04 REFERENCE STANDARDS

A. American Standards for Testing and Materials (ASTM)

1. ASTM A824 - Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence

2. ASTM C387 - Standard Specification for Packaged, Dry Combined Materials for Mortar and Concrete.

3. ASTM F567 - Standard Specification for Installation of Chain Link Fence

4. ASTM F626 - Standard Specification for Fence Fittings

5. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates

6. ASTM F1043 - Standard Specifications for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

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7. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded for Fence Structures

8. Commonwealth of Massachusetts, Mass Highway, Standard Specifications for Highways and Bridges, latest edition

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

PART 2 PRODUCTS

2.01 MATERIALS

A. Posts, gate frames, braces, rails, stretcher bars, truss rods, and tension wire shall be made of steel. Gate hinges, post caps, tops, rail ends, ties, clips, stretcher bar bands, and other parts shall also be of hot dipped galvanized steel.

1. Intermediate posts, terminal posts, braces and rails shall be Type I round, hot dipped galvanized with a minimum average zinc (Grade E) coating of 1.8 oz/sq ft meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe. Dimensions shall conform to the following:

Use and Section	Nominal Outside Diameter Inches
End, corner and pull posts fabric height 8-ft	2.875
Rails & Post Braces	1.66
Intermediate posts fabric height 8-ft	2.375

2. Post braces shall be provided for each gate, corner, pull, and end post with fabric 8-ft or more in height, and shall consist of a round tubular brace extending to each adjacent line post at approximately mid-height of the fabric, and a truss consisting of a rod not less than 5/16-in nominal diameter from the line post back to the gate, corner, pull, or end post, with a turnbuckle or other equivalent provision for adjustment.

3. Post tops shall consist of a hole suitable for the through passage of the top rail and shall fit over the outside of posts, excluding moisture from inside of posts.

4. All fences shall have continuous top rails. Rails shall consist of lengths not greater than 18-ft and shall be fitted with hot dipped galvanized steel sleeves or couplings for connecting the lengths into a continuous run. Couplings shall not be less than 6-in long with 0.070-in minimum wall thickness and shall allow for expansion and contraction of the rail. Means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

5. Tension bars shall not be less than 3/4-in and not less than 2-in shorter than normal height of fabric to which they are attached. Provide one tension bar for each end and gate post and two bars for each corner and pull post.

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6. Tie fasteners shall be 6 gauge galvanized steel wire, attaching the fabric securely to all line posts at intervals not exceeding 15-in. Tie fasteners shall be attached securely to the top rail at intervals not exceeding 18-in.

7. Bands of galvanized steel per ASTM F626 shall be provided for attaching fabric and stretcher bars to all terminal posts at intervals not exceeding 12-in. Bands shall have a minimum thickness after galvanizing of 0.078-in and minimum width of 3/4-in for posts 4-in OD or less and 0.108-in thick by 7/8-in for posts larger than 4-in. Attachment bolts shall be 5/16-in by 1-1/4-in galvanized carriage bolts with nuts.

8. Tension wire shall be No. 7 gauge conforming to ASTM A824 with zinc-coating Class 2, 1.20 oz/sf.

B. Concrete: Portland cement, 1-in maximum size aggregate and potable water producing concrete with a 3-in slump and a 28-day compressive strength of at least 3000 psi. Packaged Concrete Mix: Mix dry-packaged normal-weight concrete conforming to ASTM C387 with clean water to obtain a 2-in to 3-in slump.

C. Fabric shall be standard Heavy Industrial Grade of 6 gauge (nominal diameter 0.192-in) coated wire with a 2-in mesh with zinc-coating (Class 2) weight of not less than 2.00 oz/sf of uncoated wire surface hot-dip galvanized after fabrication.

1. Height shall be as shown on the Drawings, with overall dimension measured from ends of twists with tolerances of plus or minus 1-in.

2. Fabric on fences 72-in high and over shall be knuckled at the bottom selvage and twisted on the top selvage. On fences less than 72-in in height, top and bottom selvages shall be knuckled.

D. Privacy slats

1. Material: Match existing or Fiber-glass-reinforced plastic, UV-light stabilized, not less than 0.06 inch thick, sized to fit mesh specified for direction similar to existing fence.

2. Color: Match existing green.

E. Accessories

1. Accessories shall conform to Federal Specification RR-F-191/4D, shall be hot-dipped galvanized in accordance with ASTM A123 or A153. In addition to wire ties and clips, brace bands, tension bands and bars, tension wire and truss rods (all of which are described herein), accessories shall include the following:
   a. Caps for all exposed ends of posts.
   b. Top rail and brace ends or other suitable means of connection.
   c. Top rail sleeves to allow for expansion and contraction of the top rail.
   d. Bottom tension wire shall be 7 gauge galvanized steel wire. Fabric shall be attached to tension wire with 11 gauge galvanized steel hog rings spaced no more than 24-in on center.
   e. Barbed wire, conforming to ASTM A121, shall consist of three 12-1/2 gauge twisted line wires with 14 gauge round aluminum wire barbs, having 4 points and spaced [5]-in on center.

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f. Barbed wire support arms shall be single arm, for three strands of barbed wire and be at an angle of 45 degrees, with the top strand of barbed wire being 12-in above and 12-in out from the fence line.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fence to comply with ASTM F567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

1. Place fabric on the outside of the framework of the area to be enclosed. Install fencing on boundary lines inside of property line established by survey as required by Division 1.

2. Place fabric by securing one end, applying sufficient tension to remove all slack before making attachments elsewhere. Tighten the fabric to provide a smooth uniform appearance free from sag. The fabric can be cut by untwisting a picket and attaching each span independently at all terminal posts. Use stretcher bars with tension bands at 15-in maximum intervals. Fabric shall be installed min. 2-in above finished grade. Fasten fabric with ties to line posts at intervals not exceeding 15-in. Fasten fabric to rails with ties at intervals not exceeding 18-in. Rolls of wire fabric can be joined by weaving a single picket into the ends of the rolls to form a continuous mesh.

3.02 EXCAVATION

A. Dig or drill each post hole to accommodate post and footing to the diameter and spacings similar to existing fencing to be replaced in kind.

1. Each post foundation shall have hole diameter dug or drilled a minimum of 4 times the largest cross section of the post and a minimum depth below finished grade of 36-in. Depth of concrete footing shall be increased an additional 3-in for every 1-ft increase in the fence height over 6-ft.

3.03 SETTING POSTS

A. Center and align posts in holes 4-in above bottom of excavation. Space posts not more than 10-ft on center. Align posts vertically and align tops. Extend center top of concrete footing 1-in above grade and trowel to a crown to shed water.

B. If solid rock is encountered where an overburden of soil is not present, set fence posts in solid rock to a depth 3 times the largest cross section of fence posts. Diameter of hole shall be 1/2-in greater than the largest cross section of the fence post. Set post in rock with non-shrink grout.

C. End, corner and pull post bracing with a center rail shall be required on all fencing over 6-ft in height.

3.04 TOP RAILS

A. Run top rail on all fences continuously through line post caps with expansion couplings placed maximum 18-ft on center.

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3.05 BRACE ASSEMBLIES

A. Install braces at end and gate posts and at both sides of corner and pull posts so posts are plumb when diagonal rod is under proper tension.

3.06 BOTTOM TENSION WIRE

A. Install bottom tension wire within 6-in of bottom of fabric and weave through the stretched portion of fence running tension wire from end to end of each stretch of fence. Fasten to fabric with 0.120-in diameter (11-gauge) hog rings spaced not more than 24-in on center. Tension wire shall be taut and free of sag.

END OF SECTION

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SECTION 02900

LANDSCAPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and service required and complete all planting and related landscaping work indicated on the Drawings and as specified herein, including but not necessarily limited to the following:

1. Supplying of loam for all plant pits and planting beds. Be responsible for all topsoil preparation, testing, conditioning and fertilization and shall ensure the overall quality of the material. Loam stockpiled from other construction operations under this Section may be used.

2. Excavation of pits for trees.

3. Furnishing and planting trees and shrubs as shown on the Drawings.

4. Supplying accessory materials and wrapping, guying and staking of all trees.

5. Pruning of plant materials as specified and as approved by the Engineer.

6. Supplying and spreading mulch for tree pits and planting beds as specified herein.

7. Furnishing and placing washed gravel.

8. One year maintenance and guarantee.

9. Final cleanup and all other work required to complete the job in accordance with the Drawings and as specified herein.

B. The planting work shall be performed by a landscape contractor who is fully experienced in projects of this scope and whose main business is landscaping. Selection of the landscape contractor shall be subject to the approval of the Engineer.

1.02 RELATED WORK

A. Work on Private Property and Site Access is included in Section 01701.

B. Site preparation is included in Section 02100.

C. Miscellaneous Work and Cleanup is included in Section 02901.

D. Loaming and Seeding is included in Section 02930.

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1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, samples of all materials for inspection and approval.

1.04 REFERENCE STANDARDS

A. American Association of Nurseryman (AAN)

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

PART 2 PRODUCTS

2.01 LOAM

A. Loam shall be as specified in Section 02930.

B. No loam shall be delivered or spread in a frozen or muddy condition.

2.02 WASHED GRAVEL

A. Washed gravel shall be off-white river washed gravel, clean, granular material graded from 1-1/2-in to 2-in in size. Washed gravel shall be obtained from natural deposits and unprocessed except for removal of unacceptable sizes and materials. Washed gravel shall not contain vegetation, roots or other organic matter and shall be washed prior to placing.

B. Deliver to the site (as directed by the Engineer) a sample of washed gravel, which conforms to the above requirements. After examination and approval by the Engineer, all washed gravel incorporated into the work shall match the approved samples.

2.03 FERTILIZER, SOIL AND PLANT CONDITIONERS

A. Fertilizer shall be commercial mixed free flowing granules or pelleted fertilizer, 10-10-10 (N-P2O5-K2O) with at least 40 percent of the nitrogen in the fertilizer to be slowly available (organic) form. Fertilizer shall be delivered to the site in original unopened containers each showing the manufacturer's guaranteed analysis conforming to applicable state fertilizer laws.

B. Weed Retarder: Shall be "Garden Weeder" by Am. Chem. Products Inc. or equal, delivered in manufacturer's containers and used according to manufacturer's instructions.

C. Anti-desiccant: Shall be an emulsion which provides a protective film over plant surfaces to help retain moisture, but permeable enough to permit transpiration. Anti-desiccant shall be delivered in the manufacturer's containers and shall be mixed with water in proportions recommended by manufacturer. Anti-desiccant shall be "WILT-PRUF" available from Nursery Specialty Products Inc., Greenwich, CT or equal.

D. Mulch: Shall be Shredded Pine Bark Mulch consisting of pine bark strips no longer than 2-in in any dimension, free of wood chips, stones or other undesirable matter with a pH range between 4 and 5.

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E. Soil Sterilent: Shall be "TRIOX" by Ortho Chemical Co. or equal.

F. Water used in this work shall be furnished by the Contractor and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.

2.04 ACCESSORY MATERIALS

A. Stakes: Shall be used for supporting all trees and shall be of sound wood, uniform in size, reasonably free of knots and capable of standing in the ground at least 2 years. Stakes shall be treated with a non-toxic preservative stain with a rich dark brown color. A sample shall be provided for approval by the Engineer. Stakes shall be 2 by 4 and not less than 8-ft in length.

B. Wire: For tree staking, shall be Double No. 10 gauge galvanized soft steel wire, twisted.

C. Hose: To encase wires, shall be two-ply fiber-bearing black rubber garden hose, not less than 1/2-in inside diameter and a minimum of 8-in in length.

D. Wrapping Material: Shall be first quality, heavy waterproof crepe paper manufactured for this purpose. Strips shall be 6 to 10-in wide. Twine for tying shall be coarse sisal yarn.

2.05 PLANT MATERIALS

A. Furnish and install trees and shrubs as shown on the Drawings. Plants shall be nursery grown under climatic conditions similar to those in the locality of the project and shall conform to the variety and sizes indicated. Plants shall conform also to the indicated botanical names and standards of size, culture and quality for the highest grades and standards as adopted by the AAN in the American Standard for Nursery Stock.

B. All plants shall be freshly dug. No heeled-in plants or plants from cold storage shall be used. All plants shall be typical of their species or variety and shall have a normal habit of growth. Plants shall be sound, healthy and vigorous, well-branched and densely foliated when in leaf; shall be free of disease, insect pests, eggs or larvae and shall have healthy, well-developed root systems. All parts of the plant shall be moist and shall show active green cambium when cut.

C. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated. The trunk of each tree shall be a single trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sun-scald, frost cracks, or wounds resulting from abrasions, fire, or other causes. No pruning wounds shall be present having a diameter of more than 2-in and such wounds must show vigorous bark on all edges.

2.06 INSPECTION OF PLANT MATERIALS

A. Inspection of plants before digging shall be at the option of the Engineer. Be present if requested by Engineer, for inspection of plants at nursery.

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B. Plants shall be subjected to inspection and approval upon delivery for conformity to specified requirements as to quality, size and variety. Such approval shall not impair the right of inspection and rejection during the progress of the work.

C. Plants shall be accompanied by State Nursery inspection certificates.

PART 3 EXECUTION

3.01 DIGGING, HANDLING AND PROTECTION OF PLANTS

A. Plants shall be dug with firm natural balls of earth, of sufficient diameter and depth to include most of the fibrous roots and conforming to the standards of AAN. No plants will be accepted with plastic burlap or if the ball is cracked or broken except upon special approval of the Engineer.

B. Roots or balls of plants shall be adequately protected at all times from sun and from drying winds.

C. Plants which cannot be planted immediately upon delivery shall be set on the ground and be well-protected with soil, wet moss, bark mulch, or other acceptable material.

D. No plant shall be bound with wire or rope at any time so as to damage the bark or break branches.

3.02 PLANTING SEASONS

A. Planting shall only be done during the periods within the seasons which are normal for such work as determined by weather and by locally acceptable practice and which are approved by the Engineer. If planting occurs between June 15th and August 15th or during periods of drought, irrigation shall be furnished as directed by the Engineer.

3.03 PLANTING OPERATIONS

A. Planting: Shall be done by experienced workmen familiar with planting procedures under the supervision of a qualified foreman.

B. Stake out locations of and secure the Engineer's approval before excavating plant pits.

C. All plant pits shall be excavated with vertical sides.

D. Tree Pits: Shall be 2-ft greater in diameter than the root ball of the tree and sufficiently deep to allow for a 1-ft thick layer of compacted loam and peat moss beneath the ball.

E. Shrub Beds: Shall be tilled to 18-in below top of loam.

F. Plant backfill mixture: Loam for backfilling all tree pits shall have 3 lbs of fertilizer and 1 lb of bone meal per tree and 1 lb of fertilizer and 1/2 lb of bone meal per shrub, incorporated with peat moss at a ratio of 2 parts loam to 1 part peat moss.

G. Plants shall be set in center of pits plumb and straight and at such a level that after settlement, the crown of the plant ball will be at the surrounding finished grade.

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1. When balled and burlapped plants are set, loam shall be compacted around bases of balls to fill all voids. All burlap, ropes or wires shall be removed from the top 1/3 of the balls. Plastic burlap shall be completely removed.

H. Loam shall be backfilled in layers of not more than 9-in and each layer watered sufficiently to settle before the next layer is put in place.

I. Loam around balls shall be thoroughly compacted and watered. Immediately after the plant pit is backfilled, a saucer or shallow basin slightly larger than pit shall be formed with a ridge of soil to facilitate and contain watering.

J. Spray all plants with anti-desiccant, including trunk, branches, foliage and buds. Follow manufacturer's instructions and recommendations for application of anti-desiccant.

K. Relocated plants shall be removed and relocated according to AAN standards and guaranteed for 1 year after installation.

3.04 WRAPPING, GUYING AND STAKING

A. Trees shall be inspected by the Engineer for injury to trunks, evidence of insect infestation and improper pruning before wrapping.

B. Wrap trunks of all trees spirally from bottom to top with material specified and tie securely. The wrapping shall overlap and entirely cover the trunk from the ground to the height of the second branches and shall be neat and snug. Overlap shall be approximately 2-in.

C. All shade trees, flowering trees and evergreen trees 5 to 6-ft in height and larger shall be staked in accordance with the tree staking detail.

3.05 PRUNING, MULCHING AND PLACEMENT OF WASHED GRAVEL

A. Each plant shall be pruned at the time of planting in accordance with AAN Standards to preserve the natural character of the plant and as directed by the Engineer.

B. Pruning shall be done with clean, sharp tools.

C. Cuts over 1-in in diameter shall be painted with an approved tree paint. Paint shall cover all exposed cambium as well as other exposed living tissue. Paint shall be waterproof, adhesive and elastic, antiseptic, free from kerosene, coal tar, creosote, or any other material injurious to the life of the tree.

D. Immediately after planting operations are completed, all tree pits shall be covered with a 3-in layer of the specified mulch and shrub and ground cover beds shall be treated with weed retardant in accordance with manufacturer's instructions and covered with 3-in layer of mulch as indicated on the Drawings.

E. Washed gravel shall be placed to a 6-in depth in all areas as shown on the Drawings. Prior to placement of gravel the areas shall be treated with a soil sterilent in accordance with manufacturer’s instructions.

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3.06 OBSTRUCTIONS BELOW GROUND

A. In the event that underground boulders, underground construction work, or obstructions are encountered in any pit excavation work under this Contract, alternate locations may be selected by the Engineer at no additional cost to the Owner.

3.07 WATERING

A. Plantings must be flooded with water twice within the first 24 hours of the time of planting and not less than twice per week until provisional acceptance.

B. Suitable water for planting and maintenance will be the responsibility of the Contractor. The Contractor shall furnish his/her own hose and hose connections or other watering equipment.

3.08 MAINTENANCE

A. Maintenance shall begin immediately after each plant is installed. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected until provisional acceptance. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material removed. Guys shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and as weather and season permit.

B. Upon completion of planting and prior to provisional acceptance, remove from the site excess soil and debris and repair all damage resulting from planting operations.

3.09 INSPECTION AND PROVISIONAL ACCEPTANCE

A. The Engineer will inspect all work for provisional acceptance, at the end of the 8 week maintenance period, upon the written request of the Contractor received at least 10 days before the anticipated date of inspection.

B. Furnish full and complete written instructions for maintenance of the planting to the Owner at the time of provisional acceptance.

C. After all necessary corrective work has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the planting.

3.10 GUARANTEE PERIOD AND REPLACEMENTS

A. All plants, including relocated material shall be guaranteed for not less than one full year from the time of provisional acceptance.

B. At the end of this period, any plant that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by the Engineer, shall be replaced. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the Engineer's decision is final. Furnish a guarantee for all replacement plants for at least one full growing season.

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C. All replacements shall be plants of the same kind and size as specified. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor except where it can be definitely shown that loss resulted from vandalism.

3.11 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted by the landscape contractor at least 10 days before the anticipated date.

B. After all necessary corrective work has been completed, the Engineer will certify in writing the final acceptance of the planting.

END OF SECTION

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SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings.

B. When applicable, perform the work in accordance with other related Sections. When no applicable specification exists, perform the work in accordance with the best modern practice and/or as directed by the Engineer.

C. The work of this Section includes, but is not limited to, the following:

1. Crossing and relocating existing utilities.
2. Restoring driveways and sidewalks damaged during construction.
3. Cleaning up.
4. Incidental work.
5. Pre- and Post-construction video.
6. Protection and/or removal and reinstallation of signs, lampposts and mailboxes.
7. Restoration and replacement of curbing damaged during construction.
8. Protection and bracing of utility poles.
9. Restoring easement and right-of-ways (including removal and resetting of chain link fencing).
10. Temporary facilities.
11. Traffic Control/Regulation for Construction
12. Erosion and Sediment Control Plan
13. Stormwater Pollution Prevention Plan
14. Obtaining and complying with construction permits.
15. Restoration of buried traffic loops.

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16. Abandonment of existing pipes

17. Investigation of site separations and sewer service locations

18. Temporary construction fencing for securing work area.

19. Removal of existing fencing at south campus parking lot and reinstallation/replacement of UMass Lowell (UML) ornamental fencing as shown on plans. [Part A only]

20. Removal of pavement and subbase in DPW yard

21. Traffic Control/Regulation for Construction (including temporary pedestrian access) as shown on Sheet T-1. [Part B only]

22. Clearing and grubbing at LRTA site. [Part B only]

23. Restoring driveways and sidewalks damaged during construction at LRTA driveway impacted areas near YMCA Drive/Hale Street. [Part B only]

24. Erosion protection of stockpiled material at LRTA site. [Part B only].

25. Loaming and seeding of regraded LRTA Drainage Improvements Site. [Part B only]

E. Submit to the Engineer, in accordance with Article 2.05B of the General Conditions, a breakdown of the lump sum for miscellaneous work and cleanup including the above items as a minimum. This breakdown shall be subject to the approval of the Engineer and when so approved shall be the basis for determining progress payments and for negotiations of change order, if required.

PART 2 PRODUCTS

2.01 MATERIALS

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

PART 3 EXECUTION

3.01 CROSSING AND RELOCATING EXISTING UTILITIES

A. Perform any extra work required in crossing culverts, water courses, including brooks and drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include: bracing, hand excavation, backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items in the Bid Form. Notification of Utility Companies shall be as specified in Section 01046.

B. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, remove and relocate the utility as directed by the Engineer or cooperate with the Utility Companies concerned if they relocate their own utility.

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C. At pipe crossings and where designated by the Engineer, furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed. Payment for screened gravel at pipe crossings will be made according to the unit price bid established in the Bid Form.

3.02 RESTORING DRIVEWAYS AND SIDEWALKS DAMAGED DURING CONSTRUCTION

A. Existing public and private driveways disturbed by the construction and not paid for under other bid items shall be replaced. Paved drives shall be repaved to the limits and thicknesses existing prior to construction Gravel drives shall be replaced and regraded in kind.

B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension at the Contractor's expense.

3.03 CLEANING UP

A. Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and restore the site of the work to a neat and orderly condition.

3.04 INCIDENTAL WORK

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

3.05 PRE- AND POST-CONSTRUCTION VIDEO

A. Prior to the excavation in any street, document existing conditions using DVD recording as detailed in Section 01300. Deliver two (2) copies of the pre-construction DVD(s) to the Engineer. Contractor shall retain one copy of the pre-construction DVD in a secure location throughout the duration of the project.

B. After completion of the work, document new conditions using DVD recordings as detailed in Section 01300. Deliver two (2) copies of the post-construction DVD(s) to the Engineer. Contractor shall retain one copy of the post-construction DVD in a secure location throughout the duration of the project.

C. Contractor shall provide Owner with pre- and post-construction DVDs after completion of the project work or as directed.

3.06 PROTECTION AND/OR REMOVAL AND REINSTALLATION/REPLACEMENT OF SIGNS, LAMPPOSTS AND MAILBOXES

A. Existing signs, lampposts and mailboxes which may be damaged or removed during the course of installing the new pipelines shall be reinstalled in a vertical position at the same location from which they were removed. Replace damaged items with items of equal or better quality than the damaged items. Provide a concrete anchor as necessary, to ensure a rigid alignment. Exercise care in the reinstallation of all items to prevent damage to the newly installed pipelines.

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3.07 RESTORATION AND REPLACEMENT OF CURBING DAMAGED DURING CONSTRUCTION

A. Existing concrete, bituminous, timber or granite curbing shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension at the Contractor's expense. Granite curbing removed and reset shall conform to Section 580.64 of the Massachusetts DPW Specifications. Joints between sections shall be pointed as required after resetting. Bituminous berms shall conform to Section 501 of the Mass DPW Specifications.

3.08 PROTECTION AND BRACING OF UTILITY POLES

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

3.09 RESTORING EASEMENTS AND RIGHT-OF-WAYS

A. The work under this item shall include all protection and restoration of private property required within the limits of the temporary and permanent easements. All protection and restoration required outside the easement limits shall be at the Contractor's own expense. All protection and restoration required within the trench limits shall be paid for under the pipe items in the Bid Form.

B. Be responsible for all damage to private property due to the operations. Protect from injury all walls, fences, cultivated shrubbery and vegetables, fruit trees, pavement, underground facilities, such as water pipe, or other utilities which may be encountered along the route. If removal and replacement are required, it shall be done in a workmanlike manner so that replacement is equivalent to that which existed prior to construction.

C. Existing lawn and sod surfaces damaged by construction shall be replaced. Cut and replace the lawn and sod, or restore the areas with an equivalent depth and quality of loam, seed and fertilizer as necessary to produce a stand of grass at least equal to that existing prior to construction. These areas shall be maintained and reseeded, if necessary, until all work under this Contract has been completed and accepted. Any additional work required to restore property to the original condition shall be performed.

D. Existing trees, shrubs, plants and bushes outside of easements shall be fully protected as specified in Section 01046. The work shall also include removing and replacing those trees, shrubs and bushes as indicated on the Drawings. It shall include the careful excavation of the root ball which shall be wrapped with burlap while out of the ground. Replant them after backfilling the trench, stake them in an upright position and shall periodically water replanted trees, bushes and shrubs. Be fully responsible for ensuring that any and all trees, bushes and shrubs removed and replanted "take" and return to a viable state. Any replanted item that fails to "take" or that is so damaged as to be unsuitable for replanting shall be replaced, at no additional cost to the Owner, with a tree, bush or shrub equal to the one removed.

E. The Engineer will inspect all work for provisional acceptance upon the written request received at least 10 days before the anticipated date of inspection.

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1. After all necessary corrective work has been completed, the Engineer will certify in writing the provisional acceptance of the planting.

F. All plants shall be guaranteed for not less than 1 full year from the time of provisional acceptance.

1. At the end of this period, any plant that is missing, dead, or not in satisfactory growth, as determined by the Engineer, shall be replaced.

2. All replacements shall be plants of the same kind and size (unless otherwise noted). They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor except where it can be definitely shown that loss resulted from vandalism or the Owner's failure to maintain planting as instructed.

3. At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted by the landscape contractor at least 10 days before the anticipated date.

4. After all necessary corrective work has been completed and tree staking has been removed, the Engineer will certify in writing the final acceptance of the planting.

3.10 TEMPORARY FACILITIES

A. Furnish, install, maintain and remove all temporary facilities required for construction or called for in this Section.

3.11 TRAFFIC CONTROL/REGULATION DURING CONSTRUCTION

A. The Contractor shall develop and obtain approval of a suitable traffic plan during construction per Section 01570.

B. The Contractor shall be responsible for the installation of adequate safety precautions for the protection of the traveling public, pedestrians, and his own personnel. Sheet T-1 shows pedestrian access/sidewalks requested by LRTA.

C. The Contractor shall furnish, install, maintain, and remove warning devices, traffic and construction signage, and traffic controls for construction and maintenance operations in compliance with the traffic plan developed in accordance with Section 1570 and per Section 850, Traffic Controls for Construction and Maintenance Operations of the MHD Specifications for Highways and Bridges.

3.12 EROSION AND SEDIMENT CONTROL PLAN

A. Comply with the requirements of the Erosion and Sediment Control Plan as shown on the Drawings, specified in sections 01110 and 01170 and as directed by the Engineer.

3.13 STORMWATER POLLUTION PREVENTION PLAN

A. Comply with the requirements of the Erosion and Sediment Control Plan as shown on the Drawings, specified in sections 01110 and 01170 and as directed by the Engineer.

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3.14 OBTAINING AND COMPLYING WITH CONSTRUCTION PERMITS

A. The Contractor is responsible for obtaining and complying with all permits or their implementation including the NPDES Construction Dewatering Permit and the NPDES General Permit Stormwater Discharges from Construction Activity.

3.15 RESTORATION OF BURIED TRAFFIC CONTROL LOOPS

A. Restore any traffic control loops, conduits and magnetic sensors for access gates in the pavement that may be disturbed by the project work to pre-existing condition.

3.16 ABANDONMENT OF EXISTING PIPES

A. Perform any extra work required for cutting, plugging and filling any existing pipes that are to be abandoned. This includes all labor and equipment required for abandonment of existing catch basin laterals, sewer laterals, sewer main, etc. and all else incidental hereto for completion of the work not included for payment in other items of the Bid Form. Payment for the filling materials will be made under their respective bid items.

3.17 INVESTIGATION OF SITE SEPARATIONS AND SEWER SERVICE LOCATIONS

A. Perform any extra work required to verify private inflow separations or sewer service locations, including confirmation that existing drainage in the IFB 16-89 contain no sanitary sewer connections. This includes all labor and equipment required to verify existing conditions, perform dye testing, television inspection work and all other related efforts. Payment for private inflow disconnections and installation of new sewer services will be made under their respective bid items.

3.18 TEMPORARY CHAIN LINK CONSTRUCTION FENCING

A. The contractor shall install and maintain temporary chain link construction fencing around the perimeter of the temporary easements to safely secure the work area. See sheet C-1 for temporary easement around South Campus Parking Lot. Temporary fencing should also be constructed around the work area at the DPW Yard.

3.19 FENCING REMOVAL AND REINSTALLATION/REPLACEMENT AT SOUTH CAMPUS [PART A ONLY]

A. The contractor shall remove existing UML ornamental fencing and reinstall to existing conditions following the sewer installation as shown on the contract drawings. The contractor shall also remove existing UML chain link and replace with UML ornamental fencing to the limits as shown on the contract drawings. Refer to Appendix L – UMass Lowell Aluminum Fence Specifications for the type of fence replacement.

3.20 REMOVAL OF PAVEMENT AND SUBBASE IN DPW YARD [PART A ONLY]

A. Contractor shall remove pavement subbase as directed by engineer in the DPW yard.

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3.21 TRAFFIC CONTROL/REGULATION FOR CONSTRUCTION (INCLUDING TEMPORARY PEDESTRIAN ACCESS) AS SHOWN ON SHEET T-1. [PART B ONLY]

3.22 CLEARING AND GRUBBING AT LRTA SITE [PART B ONLY]

A. The contractor shall clear existing trees, stumps, bushes, shrubs, vegetation, logs, rubbish, and other objectionable material and all other items necessary to complete the work as shown and specified but not included under other items in the bid form at the LRTA. Trees and vegetation shall be removed from the site and disposed of in an appropriate manner. Soils shall be stockpiled on site.

3.23 RESTORING DRIVEWAYS AND SIDEWALKS DAMAGED DURING CONSTRUCTION AT LRTA DRIVEWAY IMPACTED AREAS NEAR YMCA DRIVE/HALE STREET. [PART B ONLY]

A. Existing public and private driveways disturbed by the construction and not paid for under other bid items shall be replaced. Paved drives shall be repaved to the limits and thicknesses existing prior to construction Gravel drives shall be replaced and regraded in kind.

B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension at the Contractor's expense.

3.24 EROSION PROTECTION OF STOCKPILED MATERIAL AT LRTA SITE. [PART B ONLY].

A. Surplus excavated materials stockpiled at the LRTA site, as approved by the Engineer, should be seeded and otherwise controlled to minimize erosion impacts. Erosion control measures put in place during construction shall remain in place around the stockpile material.

3.25 LOAMING AND SEEDING OF REGRADED LRTA DRAINAGE IMPROVEMENTS SITE [PART B ONLY].

A. Contractor shall loam and seed regraded LRTA Drainage Improvements Site per Section 02930. These areas shall be maintained and reseeded, if necessary, until all work under this Contract has been completed and accepted.

END OF SECTION

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SECTION 02930

LOAMING AND SEEDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and provide erosion control and place topsoil, finish grade, apply lime and fertilizer, hydraulically apply seed and mulch and maintain all seeded areas as shown on the Drawings and as specified herein, including all areas disturbed.

1.02 RELATED WORK

A. Environmental Protection Procedures are included in Section 01110.

B. Site preparation is included in Section 02100.

C. Earthwork is included in Section 02221.

D. Landscaping is included in Section 02900.

E. Miscellaneous Work and Cleanup is included in Section 02901.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, samples of all materials for inspection and acceptance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil shall be fertile, friable, natural topsoil typical of topsoil of the locality and shall be obtained from a well drained site that is free of flooding. It shall be without admixture of subsoil or slag and free of stones, lumps, plants or their roots, sticks, clay, peat and other extraneous matter and shall not be delivered to the site or used while in a frozen or muddy condition. Topsoil as delivered to the site or stockpiled shall have pH between 6.0 and 7.0 and shall contain not less than 5 percent nor more than 8 percent organic matter as determined by loss of ignition of moisture-free samples dried at 100 degrees Celsius. The topsoil shall meet the following mechanical analysis:

	Percentage Finer
1-in screen opening	100
No. 10 mesh	95 to 100
No. 270 mesh	35 to 75
0.002 mm*	5 to 25

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*Clay size fraction determined by pipette or hydrometer analysis.

1. At least 30 days prior to anticipated start of topsoiling operations a one pint sample of topsoil material shall be delivered to the Engineer for testing and approval. Based on tests performed by the Engineer, the topsoil shall be identified as acceptable, acceptable with certain fertilizer and limestone applications or unacceptable. If the topsoil is found acceptable the fertilizer and lime requirements will be as specified or as recommended by the Engineer. If the topsoil is found unacceptable, identify another source of topsoil and incur all expenses associated with testing additional samples. All topsoil incorporated into the site work shall match the sample provided to the Engineer for testing. Topsoil stockpiled under other Sections of this Division may be used subject to the testing and approval outlined above. Be responsible for screening stockpiled topsoil and providing additional topsoil as required at his own expense.

B. Fertilizer shall be commercial mixed free flowing granules or pelleted fertilizer, 10-20-10 (N-P2O5-K2O) grade for lawn and naturalized areas. Fertilizer shall be delivered to the site in original unopened containers each showing the manufacturer's guaranteed analysis conforming to applicable state fertilizer laws. At least 40 percent of the nitrogen in the fertilizer used shall be in slowly available (organic) form.

C. Lime shall be ground limestone containing not less than 85 percent calcium and magnesium carbonates and be ground to such fineness that at least 50 percent shall pass a 100-mesh sieve and at least 90 percent shall pass a 20-mesh sieve.

D. Seed shall be labeled in accordance with USDA Rules and Regulations under the Federal Seed Act and applicable State seed laws. Seed shall be furnished in sealed bags or containers bearing the date of the last germination, which date shall be within a period of 6 months prior to commencement of planting operations. Seed shall be from same or previous year's crop; each variety of seed shall have a purity of not less than 85 percent, a percentage of germination not less than 90 percent, shall have a weed content of not more than 1 percent and contain no noxious weeds. The seed mixtures shall consist of seed proportioned by weight as follows:

1. Lawn Area Seed Mix (For areas as indicated on the Drawings)

"Rebel II" Tall Fescu	70 percent
"Baron" Kentucky Bluegrass	10 percent
"Palmer" Perennial Ryegrass	20 percent

2. Natural Area Seed Mix (For all slopes and disturbed areas not otherwise indicated)

Kentucky 31 Fescue	40 percent
Palmer Perennial Ryegrass	30 percent
Birds Foot Trefoil (Empire Variety)	15 percent
Red Clover	5 percent

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White Clover	5 percent
Redtop (Streaker Variety)	5 percent

E. The seed shall be furnished and delivered premixed in the proportions specified above. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturers for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed and also the net weight and date of shipment. No seed may be sown until the certificates have been submitted.

F. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.

G. Mulch shall be specially processed 100 percent Virgin wood fiber mulch containing no growth or germination-inhibiting factors. Wood fiber mulch shall be "Second Nature Regenerated wood fiber as by Central Fiber Corporation, Wellsville, KS or equal. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogeneous slurry. When sprayed on the ground, the material shall allow absorption and percolation of moisture. Each package of the wood fiber shall be marked by the manufacturer to show the air dry weight content and not contain in excess of 10 percent moisture.

H. Erosion control blanket is specified in Section 02270.

I. Straw Mulch is specified in Section 02270.

J. Tackifier is specified in Section 02270.

PART 3 EXECUTION

3.01 APPLICATION

A. Unless otherwise shown on the Drawings, topsoil shall be placed to a minimum compacted depth of 6-in on all parts of the site not covered with structures, pavement, or existing woodland.

B. For all areas to be seeded:

1. Lime shall be applied at the rate of 150 lbs/1,000 sq ft or as determined by the soil test to bring topsoil pH to a range of 6.0 to 7.0.

2. Fertilizer (10-20-10) shall be applied at the rate of 30 lbs/1,000 sq ft or as determined by the soil test.

3. Seed shall be applied at the rate of 5 lbs/1,000 sq ft.

4. Fiber mulch shall be applied at the rate of 45 lbs/1,000 sq ft.

5. Straw mulch shall be applied to all slopes of 3 horizontal to 1 vertical and steeper at a rate of 75 lbs/1000 sq ft.

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6. Tackifier shall be installed per manufacturer's instructions and reapplied as necessary to insure the straw mulch is stabilized until reasonable turf growth is established as determined by the Engineer with a minimum rate of 1 gal/1000 sq ft per application.

C. If possible, limestone shall be applied 2 to 3 months before the application of fertilizer. Limestone may not be mixed with fertilizer for application and shall be applied a minimum of 2 weeks prior to fertilizer application.

D. After the topsoil is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over the loam surface and thoroughly incorporated by heavy raking to at least one half the depth of topsoil.

E. The application of fertilizer may be performed hydraulically in one operation with hydroseeding and fiber mulching. Clean all structures and paved areas of unwanted deposits of the hydroseeded mixture.

F. Straw Mulch and Tackifier shall be applied immediately following seeding operations (same day) unless otherwise approved by the Engineer.

3.02 INSTALLATION

A. Previously established grades, as shown on Drawings shall be maintained in a true and even condition.

B. Subgrade shall be prepared by tilling prior to placement of topsoil to obtain a more satisfactory bond between the two layers. Tillage operations shall be across the slope. Tillage shall not take place on slopes steeper than 2 horizontal to 1 vertical or where tillage equipment cannot be operated. Tillage shall be accomplished by disking or harrowing to a depth of 9-in parallel to contours. Tillage shall not be performed when the subgrade is frozen, excessively wet, extremely dry or in other conditions which would not permit tillage. The subgrade shall be raked and all rubbish, sticks, roots and stones larger than 2-in shall be removed. Subgrade surfaces shall be raked or otherwise loosened immediately prior to being covered with loam.

C. Topsoil shall be placed over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling, the complete work will conform to the lines, grades and elevations indicated. No loam shall be spread in water or while frozen or muddy.

D. After topsoil has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. All stiff clods, lumps, roots, litter and other foreign material shall be removed from the loamed area and disposed of. The areas shall also be free of smaller stones, in excessive quantities, as determine by the Engineer. The whole surface shall then be rolled with a hand roller weighing not more than 100 lbs/ft of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional loam and the surface shall be regraded and rolled until a smooth and even finished grade is created.

E. Seeding, mulching and conditioning shall only be performed during those periods within the seasons which are normal for such work as determined by the weather and locally accepted practice, as approved by the Engineer. Hydroseed and straw mulch only on a calm day.

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F. Schedules for seeding and fertilizing must be submitted to the Engineer for approval prior to the work. Seeding as specified herein shall be accomplished between the period of April 1 to June 1 or August 15 to October 1. Seeding during the period from October 2 to March 31 shall only be undertaken upon approval of the Engineer. Seeding during the period from June 1 to August 14 shall only be performed if irrigation is provided.

G. Seeding shall be done within ten days following soil preparation. Seed shall be applied hydraulically at the rates and percentages indicated. The spraying equipment and mixture shall be so designed that when the mixture is sprayed over an area, the grass seed and mulch shall be equal in quantity to the specified rates. Prior to the start of work, furnish the Engineer with a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder. Upon completion of seeding operations, furnish the Engineer with a certified statement on the actual quantity of solution applied.

H. In order to prevent unnecessary erosion of newly topsoiled and graded slopes and unnecessary siltation of drainage ways, carry out seeding and mulching as soon as he has satisfactorily completed a unit or portion of the project. For the purpose of this project a unit is defined as 10,000 sq ft. When protection of newly loamed and graded areas is necessary at a time which is outside of the normal seeding season, protect those areas by what ever means necessary as approved by the Engineer and shall be responsible for prevention of siltation in the areas beyond the limit of work.

I. Erosion control blankets shall be installed in all drainage swales and ditches as shown on the Drawings and as directed by the Engineer in accordance manufacturer's instructions. The area to be covered shall be properly prepared, fertilized and seeded before the blanket is applied. When the blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. The blankets shall be applied in the direction of water flow, butted snugly at the ends and side and stapled. Blankets shall be placed a minimum of three rows (of 4-ft) wide (total 12-ft width) within the drainage swale/ditch and stapled together in accordance with manufacturer's instructions. The staples shall be made of wire, .091-in in diameter or greater, "U" shaped with legs 6-in in length and a 1-in crown. The staples shall be driven vertically into the ground, spaced approximately two linear yards apart, on each side and one row in the center alternately spaced between each size. Adjoining shall not be overlapped and shall utilize a common row of staples to attach.

J. When newly graded subgrade areas cannot be topsoiled and seeded because of season or weather conditions and will remain exposed for more than 30 days, protect those areas against erosion and washouts by whatever means necessary such as straw applied with a tar tack, wood chips or by other measures as approved by the Engineer. Prior to application of topsoil, any such materials applied for erosion control shall be thoroughly incorporated into the subgrade by discing. Fertilizer shall be applied prior to spreading of topsoil.

K. On slopes in addition to straw mulch and tackifier, provide against washouts by an approved method. Any washout which occurs shall be regraded and reseeded at the Contractor's expense until a good turf is established.

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3.03 MAINTENANCE AND PROVISIONAL ACCEPTANCE

A. Keep all seeded areas watered and mowed and in good condition, reseeding all seeded areas if and when necessary until a good, healthy, uniform growth is established over the entire area seeded and shall maintain all seeded areas in an approved condition until provisional acceptance.

B. The Engineer will inspect all work for provisional acceptance at the end of the 10 week maintenance period, upon the written request received at least 10 days before the anticipated date of inspection. The maintenance period must occur during the growing season between March 31 and October 1 and shall include a minimum of three mowings.

C. A satisfactory turf will be defined as:

1. No bare spots larger than 3 sq ft.

2. No more than 10 percent of total area with bare spots larger than 1 sq ft.

3. Not more than 15 percent of total area with bare spots larger than 6-in square.

D. After the inspection has occurred but prior to provisional acceptance, a soil test shall be performed to determine if additional soil fertilization should occur. If necessary additional fertilizer not to exceed 30 lbs/1000 sq ft of 20-10-10 shall be applied as directed by the Engineer.

E. Furnish full and complete written instructions for maintenance of the seeded areas to the Owner at the time of provisional acceptance.

F. The inspection by the Engineer will determine whether maintenance shall continue. Continue maintenance until all areas of the site meet the minimum requirements specified above.

G. After all necessary corrective work and clean-up has been completed, and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the turf areas. Maintenance of all turf areas shall cease on receipt of provisional acceptance.

3.04 GUARANTEE PERIOD AND FINAL ACCEPTANCE

A. All seeded areas shall be guaranteed for not less than 1 full year from the time of provisional acceptance.

B. At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted at least 10 days before the anticipated date. Seeded areas not demonstrating satisfactory stands as outlined above, as determined by the Engineer, shall be renovated, reseeded and maintained meeting all requirements as specified herein.

C. After all necessary corrective work has been completed, the Engineer shall certify in writing the final acceptance of the seeded areas.

END OF SECTION

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SECTION 03301

CONCRETE AND REINFORCING STEEL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install all concrete work complete as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data. Submittals shall include the following:

1. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water cement ratio, product data and chemical analysis of cement.

2. Placing drawings and bar bending details in conformity with the recommendations of ACI 315.

3. Technical data on all materials and components.

4. Product data and Material Safety Data Sheets (MSDS) for all concrete admixtures and curing agents.

B. Test Reports

1. Sieve analysis and mortar bar expansion test results of fine and coarse aggregates.

2. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water cement ratio, type and manufacturer of cement, and either a. or b. below.

a. Standard deviation data for each proposed concrete mix based on statistical records.

b. Water cement ratio curve for each proposed concrete mix based on laboratory tests. Give average cylinder strength test results at 28 days for laboratory concrete mix designs. Provide results of 7 and 14 day tests if available.

C. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

2. Certificate of conformance for concrete production facilities from the NRMCA.

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1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

2. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

3. ASTM C33 - Standard Specification for Concrete Aggregates.

4. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

5. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

6. ASTM C150 - Standard Specification for Portland Cement.

7. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

8. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

9. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

10. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

11. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).

B. American Concrete Institute (ACI).

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

2. ACI 301 - Standard Specification for Structural Concrete.

3. ACI 305R - Hot Weather Concreting.

4. ACI 306R - Cold Weather Concreting.

5. ACI 315 - Details and Detailing of Concrete Reinforcement.

6. ACI 318 - Building Code Requirements for Structural Concrete.

C. Concrete Reinforcing Steel Institute (CRSI)

1. MSP - Manual of Standard Practice

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D. National Ready Mixed Concrete Association (NRMCA)

1. Quality Control Manual, Section 3 - Certification of Ready Mixed Concrete Production Facilities.

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

1.04 QUALITY ASSURANCE

A. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

B. Reinforced concrete shall comply with ACI 318.

C. All testing and inspection services required, unless otherwise specified, shall be provided and paid for by the Owner. Testing necessary to establish the concrete mixes shall be performed by and at the expense of the Contractor. Methods of testing shall comply with the latest applicable ASTM standards.

1.05 DELIVERY, STORAGE AND HANDLING

A. Reinforcing steel shall be shipped and stored with bars of the same size and shape in fastened bundles with durable tags, marked in a legible manner with waterproof markings showing the same designations as shown on the submitted placing drawings. Reinforcing steel shall be free from mill scale, loose rust, dirt, grease, or other foreign matter. Store off the ground and protect from moisture, dirt, oil, or other injurious contaminants.

B. Products shall be stored in conformity with the manufacturer's recommendations.

C. Sand, aggregates and cement shall be stored or stockpiled in conformity with the recommendations of ACI 301.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

C. Materials shall comply with this Section and any applicable State or local requirements.

2.02 MATERIALS

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A. Cement shall be domestic portland cement conforming to ASTM C150, Type II. Air entraining cements shall not be used.

B. Fine aggregate shall be washed inert natural sand conforming to the requirements of ASTM C33.

C. Coarse aggregate shall be a well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, for the specified coarse aggregate size number listed in Table 1 herein. Limits of Deleterious Substances and Physical Property Requirements shall be as recommended for severe weathering regions.

1. The fine and coarse aggregates used shall not cause expansion of mortar bars greater than 0.1 percent in 16 days when tested in accordance with ASTM C1260 and using the cement proposed for the project. If aggregates proposed for use do not meet this requirement, then satisfy either a. or b. below.

a. Total equivalent alkali content of the cement used shall not exceed 0.60 percent as provided in the Optional Chemical Requirements of ASTM C150.

b. The fine and coarse aggregates used shall not cause expansion of mortar bars greater than 0.1 percent in 16 days when tested in accordance with ASTM C1260 and using the cement proposed for the project.

D. Water shall be potable, clean and free from injurious amounts of oils, acids, alkalis, organic matter, or other deleterious substances.

E. Concrete admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures.

1. Air entraining admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water reducing admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing admixtures.

F. Reinforcing steel bars shall be deformed, intermediate grade, steel conforming to ASTM A615 Grade 60.

G. Tie wires for reinforcing steel shall be 16 gauge or heavier, black annealed wire.

H. Precast concrete block bar supports shall conform to CRSI - Manual of Standard Practice (MSP) for Precast Concrete Bar Supports.

I. Sheet Curing Material – Waterproof paper, polyethylene film or white burlap polyethylene sheeting, all conforming to ASTM C171.

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2.03 MIXES

A. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

B. The design of each mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if not available, be developed by an independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. Acceptance of mixes based on laboratory tests shall be based on strengths greater than the specified design strengths specified in Table 1. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to the required average compressive strength in Table 5.3.2.2 of ACI 318. The resulting mix shall not conflict with the limiting values for maximum water cement ratio and net minimum cementitious content as specified in Table 1.

C. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the compression strength requirements in conformity with the above paragraph and ACI 318.

D. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.

E. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1.

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

TABLE 1

Class	Design Strength (1)	Cement ASTM C150	Cement Content (2)	Coarse Aggregate (3)	W/C (4)	WR (5)	Slump Range Inches
A	2500	Type II	440	57	0.62 max.	Yes	1-4
D	4000	Type II	590	67	0.44 max.	Yes	3-5

All concrete classes shall have 3.5 to 5 percent air entrainment.

NOTES:
(1) Minimum compressive strength at 28 day
(2) Minimum cement content in lbs/cu yd
(3) Size number in ATM C33
(4) W/C is maximum water cement ratio by weight
(5) WR is water reducing admixture

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2.04 MEASURING, BATCHING, MIXING AND TRANSPORTING CONCRETE

A. Measuring, batching, mixing and transporting concrete shall conform to ASTM C94 and the requirements herein or as otherwise approved in writing by the Engineer.

B. Ready-mixed concrete, whether produced by a concrete supplier or the Contractor shall conform to the requirements above. No hand mixing will be permitted.

C. Admixtures shall be dispensed into the batch in conformity with the recommendations of the manufacturer of the admixtures.

D. Concrete shall be mixed until there is uniform distribution of the materials and shall be discharged completely before the mixer is recharged. The mixer shall be rotated at a speed recommended by the mixer manufacturer and mixing shall be continued for at least 1-1/2 minutes after all the materials are in the mixer. Concrete shall be placed within 1-1/2 hours of the time at which water was first added, otherwise it shall be rejected. Concrete which has been remixed or retempered, or to which an excess amount of water has been added, shall also be rejected.

2.05 FORMS

A. Forms shall be free from roughness and imperfections, substantially watertight and adequately braced and tied to prevent motion when concrete is placed. No wooden spreaders will be allowed in the concrete.

B. Wire ties will not be allowed. Metal ties or anchorages which are necessary within the forms shall be so constructed that the metal work can be removed for a depth of at least 1-in from the surface of the concrete without injury to such surface by spalling or otherwise. Forms shall be thoroughly cleaned before using and shall be treated with oil, or other approved material.

C. All exposed edges of the finished concrete shall be chamfered 3/4-in.

2.06 DAMPPROOFING

A. Two coats of bituminous waterproofing material applied to the exterior surfaces of structure from the top of footing to 6-inches below finished grade by brush or spray and in accordance with the manufacturer's recommendations. Dampproofing shall be Hydrocide 700 by BASF Building Systems; Sonneborn Brand Products, 920 AF Fibered Emulsion Mastic (Trowel Grade) by Karnak Corporation, Sealmastic Emulsion Dampproofing Type II – Brush on/ Spray Grade by WR Meadows Inc. or equal.

PART 3 EXECUTION

3.01 REINFORCING STEEL

A. Reinforcing steel shall be accurately fabricated to the dimensions shown. Bars shall be bent around a revolving collar having a diameter of not less than that recommended in ACI 318. All bars shall be bent cold.

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B. Unless otherwise shown, splices in reinforcing steel shall be lapped in conformity with ACI 318 but not less than Class B tension lap splice. All bar splices shall be staggered wherever possible. When splicing bars of different diameters, the length of lap is based on the larger bar.

C. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt and other coatings, including ice, that reduce or destroy bond. Bars shall be reinspected and cleaned when necessary.

D. Reinforcement which is to be exposed for a considerable length of time after being placed shall be given a heavy coat of cement grout.

E. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcements have been checked and permission given to proceed by the Engineer.

3.02 INSPECTION AND COORDINATION

A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel, and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

3.03 CONCRETE APPEARANCE

A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected.

B. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete when viewed in good lighting from 10-ft away shall be pleasing in appearance and at 20-ft shall show no visible defects.

3.04 PLACING AND COMPACTING

A. Reinforcement, where required, shall be accurately placed in exact positions shown, shall be secured against displacement with annealed iron wire ties or suitable clips at intersections and shall have a clear space of 2-in between the steel and face of forms unless otherwise indicated. Wire ties passing through the forms for the purpose of holding the steel in proper position will not be allowed. Plastic protected bar supports conforming to CRSI Bar Support Specifications, Class 1 – Maximum Protection may be used where approved by the Engineer for the purpose of maintaining the clearance between reinforcement and forms. Reinforcing bars shall be free from rust, scale, dirt, grease and injurious contaminants.

B. No concrete shall be placed until forms, condition of subgrade and method of placement have been approved by the Engineer. Before depositing concrete, all debris, foreign matter, dirt and water shall be removed from the forms. The contact surface between concrete previously placed and new concrete shall be cleaned and brushed with cement paste. Concrete, except as indicated on the Drawings, shall not be placed in water or submerged within 24 hours after placing, nor

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shall running water be permitted to flow over the surface of fresh concrete within 4 days after its placing.

C. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Pumping of concrete will be permitted when an approved design mix and aggregate sizes, suitable for pumping, are used. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials. If the section cannot be placed continuously, place construction joints as specified or as approved. Place concrete for walls using tremie tubes in 12 to 24-in lifts, keeping the surface horizontal. Do not drop concrete more than 4-ft.

D. High frequency mechanical vibrators shall be used to the extent necessary to obtain proper consolidation of the concrete, but not to move or transport concrete in the forms. Care shall be taken to avoid segregation of aggregates by excess vibration. Vibration shall continue until the frequency returns to normal, trapped air ceases to rise and the surface appears liquefied, flattened and glistening. Concrete adjacent to forms and around pipe stubs shall be carefully spaded or rodded.

3.05 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. All concrete shall be cured in conformity with ACI 301. Concrete shall be cured by either water curing or sheet material curing. Water curing shall be by ponding, by continuous sprinkling or by covering with continuously saturated burlap.

C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

D. Concrete placed during cold weather shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 306R. Salt, manure or other chemicals shall not be used for cold weather protection.

E. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints. Immediately cover plastic concrete with sheet material during hot weather.

3.06 FIELD TESTS

A. Sets of three field control cylinder specimens will be taken by the Engineer during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls. One cylinder shall be broken at 7 days and two cylinders shall be broken and their strengths averaged at 28 days. When the average 28 day compressive strength of the cylinders in any set falls below the specified compressive strength or below proportional minimum 7 day strengths (where proper relation between 7 and 28 day strengths have been established by tests); the Engineer may reject the concrete represented by the set of cylinders, may require modification of

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the concrete and/or require modification of the proportions, water content, or temperature conditions of the design mix to achieve the required strengths.

B. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through his/her operations and furnishing material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Owner.

C. Slump tests will be made in the field by the Engineer in conformity with ASTM C143.

D. Tests for air content shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173.

3.07 STRIPPING AND FINISHING CONCRETE

A. Forms shall not be stripped before the concrete has attained the strength of at least 30 percent of the specified design strength, nor before reaching approximately “100 day-degrees” of moist curing (whichever is the longer).

B. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or doing any other work adjacent thereto.

C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Engineer.

D. As soon as forms have been stripped, form ties, if employed, shall be removed, and the recess filled to insure complete watertightness. Any defects in the surface of the walls shall be chipped out and repaired in a workmanlike manner. Defective concrete where it occurs shall be cut to a minimum depth of 1-in, thoroughly roughened and neat cement brushed in. The hole shall then be filled with mortar in the proportion of 1 part cement and 2-1/2 parts sand with a minimum of water. Mortar for filling form tie recesses shall be mixed to a slightly damp consistency (just short of "balling"), pressed into the recess until dense, and troweled smooth. Mortar in larger patches shall be applied and allowed to assume a partial set following which it shall be struck off flush with the adjoining surface. Patches shall be kept moist for several days to assure proper curing.

E. Concrete to receive dampproofing and concrete walls not exposed in the finished work shall have off-form finish with fins and other projections removed and tie cones and defects filled as specified.

F. Top surface of slabs shall be screeded to the established grades and shall be a true plane with a tolerance of 1/8-in when checked with a 10-ft straightedge. The surface shall be finished to give a smooth, hard, even surface free from high or low spots or other defects. Failure to meet the condition shall be cause for removal, grinding, or other correction as directed by the Engineer.

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3.08 SCHEDULE

A. The following (Table 2) are the general applications for the various concrete design strengths to be used:

TABLE 2

Class	Design Strength (psi)	Description
A	2,500	Concrete fill
D	4,000	Concrete headwall structure

END OF SECTION

Division 11 – Equipment

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SECTION 11285

STOP LOGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install and test, complete and ready for operation, stop logs at the Marginal Sewer Relief Structure as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Concrete work is included in Division 3.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, copies of all materials required to establish compliance with the Specifications. Submittals shall include the following:

1. Complete description of all materials.

2. Certified shop and installation drawings showing all details of construction, dimensions, and anchor bolt locations and sizes.

3. Descriptive bulletins, and/or catalogs of the equipment.

4. Installation instructions for stop log guides and logs.

B. Operating and maintenance instructions shall be furnished to the Engineer as provided for in Section 01300.

C. A list of the manufacturer's recommended set of spare parts and prices required for normal operation and maintenance shall be furnished with the equipment by the manufacturer.

1.04 QUALITY ASSURANCE

A. The items specified under this Section shall be furnished by manufacturers with at least 5 years experience with three satisfactory references from similar projects during the previous year.

B. All stop logs shall be provided by a single manufacturer.

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1.05 SYSTEM DESCRIPTION

A. The stop logs shall be used to control high flows within the marginal sewer and convey flows down the marginal sewer relief pipe to the Walker Interceptor as shown on drawings and stop log schedule.

Stop Log Schedule

Location	Nominal Size Channel Width by Height	Maximum Seating Head	Maximum Unseating Head
Marginal Sewer Relief Structure	30" x 48"	7 FT	0

PART 2 PRODUCTS

2.01 STOP LOGS

A. General:

1. Provide stop logs as indicated on the Contract Drawings.

2. Stop logs shall be completely shop-assembled to insure proper fit and adjustment of all parts.

B. Materials:

1. Guides shall be stainless steel ASTM A267 T304 or extruded aluminum B306 6061-T6.

2. Logs shall be extruded aluminum B306 6061-T^ or Fiberglass Reinforced Polyster (FRP).

3. Bottom seals shall be neoprene ASTM D2000 Grade AA625. Side seals shall be neoprene ASTM D2000 Grade 2 BC510.

4. Lifting pins shall be stainless steel ASTM A267 T304 or extruded aluminum B306 6061-T6.

C. Guides shall be styled for embedment, wall mounting or in-channel mounting as indicated on the Contract Drawings. The guides shall be designed for maximum rigidity and shall be provided with a side angle for surface mounting using anchor bolts. The invert of the frame shall be channel welded to the lower ends of the resilient seal mounted on the log. Inverts shall be designed for minimal flow interference along the bottom of the channel.

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D. Each stop log shall be 6-inches high, identical and designed to stack in any order. Allowable leakage of the stop logs shall not exceed 0.20 gpm per foot of wetted perimeter. Logs shall be of sufficient weight to be submerged under their own weight. The logs shall have resilient lip-type seals that are attached along the sides and across the bottom with type 304 stainless steel or extruded aluminum fasteners. Seals shall be located on the stop logs for ease of inspection and replacement. Frame mounted seals are unacceptable. All stop logs shall be flat and level. The stop log shall not deflect more than 1/360 of the span of the log under design head. Provide total number of stop logs to achieve full channel height coverage.

E. Aluminum stop logs shall be of one-piece extruded aluminum. The extrusions shall have a minimum thickness of 5/16-inch. The bottom of the log shall be extruded in a way to accept a specially extruded resilient seal to provide flush bottom closure. End caps will not be allowed on stop logs.

F. Fiberglass stops logs shall be totally encapsulating and internal-reinforcing structure. Each log shall be molded individually to the exact dimensions indicated on the Contract Drawings. Stop logs shall be manufactured of reinforced thermoplastic containing ultraviolet absorbers. The surface shall be resin-rich to a depth of 0.010-inches to 0.020-inches and reinforced with C-glass orpolymeric fiber surfacing material. The surface shall be free of exposed reinforcing fibers. The composition of these layers shall be approximately 95% (by weight) resin. The remaining laminate shall be made up of copolymer composite and reinforcing fibers in a form, orientation and position to meet the mechanical requirements. Structural reinforcing shall be utilized to attain necessary stiffness to meet deflection requirements and shall be well encapsulated with a laminate not less than 1/4-inch thick on each side to insure against any permeation by water to the core area. Lifting pins shall be bonded to the log with sufficient reinforcing to withstand the lifting force. Stop log covers which are fabricated from pressed or laminated sheet material and glued to substructure will not be acceptable.

G. All necessary attaching bolts and anchor bolts shall be furnished by the stop log manufacturer.

H. One lifting device shall be provided for each stop log width. The lifting device shall be capable of installing and removing all logs. The lifting device shall be equipped with suitable connecting points for crane operation. The lifting beam shall be built in a manner to automatically latch on to the stop logs when lowered into the guide frame. The lifting beam shall have a tag line release mechanism.

I. Stop logs shall be manufactured by Rodney Hunt Company, Whipps Inc., Golden Harvest, Inc. Golden Gates, Or equal.

2.03 SURFACE PREPARATION AND PAINTING

A. Surfaces shall be painted per manufacturer when required.

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PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of all items shall be done by the Contractor in an accurate, undamaged, plumb and level, and secure manner. It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's drawings and recommendations. Frames and guides shall be installed in a true vertical plane and shall be installed with 90 degree corners.

B. Stop logs with embedded guides and/or inverts shall be installed in accordance with the recommendations of the manufacturer subject to the Engineer's approval.

3.02 FIELD QUALITY CONTROL

A. The Contractor shall furnish the services of a factory representative who has complete knowledge of proper operation and maintenance to inspect and approve the final installation and supervise initial adjustments and a test of the equipment.

B. After installation approval, equipment under this Section shall be field tested at maximum differential head to ensure that all items of equipment are in compliance with the Specifications, including the leakage requirements, noted in PART 2.

C. In the event that any product fails to meet the above requirements, the necessary changes shall be made and the unit retested. If the unit remains unable to meet the test requirements to the satisfaction of the Engineer, it shall be removed and replaced with a satisfactory unit at no additional cost to the Owner.

END OF SECTION

Appendix A

Boring Logs — Marginal Sewer Relief Pipe

Phone: (603) 437.1610 **New Hampshire Boring, Inc.** **Fax: (603) 437.0034**
PO Box 165
Derry, NH 03038
E-Mail: nhb@nhboring.com

Boring # CDM-101 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 1/19/2015 **Date End: 1/19/2015** **Location:** See Plan Sheet 1 of 3

Casing: HW	**Sampler:**	**Casing:** 4"ID	**Sampler:**
Hammer: 300lb.	S/S 140 lbs.	Size: Fall:	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
1/19/15	**10'**	**20'**	

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
							9" Asphalt
	S-1	1' -1'7"	7	4	89 - 11/1"		Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, some silt, little brick fragments
	S-2	3'-5'	24	8	15-13 12-12		Moist, medium dense, brown, fine to coarse GRAVEL and fine to coarse SAND, some silt, little brick fragments
	S-3	5'-7'	24	6	9-5 9-5		Moist, medium dense, grey, fine to coarse GRAVEL, trace fine to coarse sand, trace silt
	S-4	7'-9'	24	9	4-3 3-4		Moist, loose, brown, fine to medium SAND, some silt, trace fine gravel
	S-5	9'-11'	24	18	1-WOH 1-2		TOP 8" Moist, very loose, brown, fine to coarse SAND, some silt BOT 10" Moist, very loose, tan, fine SAND and SILT
	S-6	11'-13'	24	18	4-6 12-14		Moist, very stiff, tan, SILT and fine SAND
	S-7	13'-15'	24	24	12-19 19-18		TOP 9" Wet, medium dense, fine to medium SAND, little silt MID 10" Moist, dense, SILT and fine SAND BOT 5" Wet, dense, fine to coarse SAND, little silt
	S-8	15'-17'	24	10	9-7 8-16		Wet, medium dense, brown, fine to coarse SAND, little silt
	S-9	17'-19'	24	18	6-14 18-16		Wet, dense, brown, fine to coarse SAND, little silt, trace fine gravel
	S-10	19'-21'	24	9	6-8 11-18		Wet, medium dense, brown, fine to coarse SAND, little silt

Driller: Ken Smith	Helper: Dave Balsamo	**Inspector: Jennifer Todd**

Remarks:

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

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Boring # CDM-101 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 1/19/2015 **Date End: 1/19/2015** **Location:** See Plan Sheet 2 of 3

Casing: HW Hammer: 300lb.	**Sampler:** S/S 140 lbs.	**Casing:** 4"ID Size: Fall:	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
1/19/15	**10'**	**20'**	

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
	S-11	25'-27'	24	14	19-14 9-10		Wet, medium dense, fine to coarse SAND, little fine gravel, some silt
							Hit Rock @ 28'6" Roller Bit to 30'
	S-12	30'-30'	0	0	100/0"		No Penetration/No Recovery
							30' BOE

Driller: Ken Smith	Helper: Dave Balsamo	**Inspector: Jennifer Todd**

Remarks:

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

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Boring # CDM-101 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 1/19/2015 **Date End: 1/19/2015** **Location:** See Plan Sheet 3 of 3

Casing: HW	**Sampler:**	**Casing:** 4"ID	**Sampler:**
Hammer: 300lb.	S/S 140 lbs.	Size: Fall:	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
1/19/15	**10'**	**20'**	

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
							BOE 30' Install 2" PVC Monitoring Well At 20' 10' Screen 10' Riser 1 End Cap 1 J Plug Sand 20'-8' Betonite 8'-6' 6'-1' Cuttings 1'-0' Concrete 1 Roadbox

Driller: Ken Smith Helper: Dave Balsamo **Inspector: Jennifer Todd**

Remarks:

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

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Boring # CDM-102 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 3/16/2015 **Date End: 3/16/2015** **Location:** See Plan Sheet 1 of 2

Casing: HW	**Sampler:**	**Casing:** 4"ID	**Sampler:**
Hammer: 300lb.	S/S 140 lbs.	Size: Fall:	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
3/16/15	**8.6'**	**20'**	

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
	S-1	0'-2'	24	20	24-36 14-12		Moist, dense, dark brown to dark grey, fine to coarse SAND, some fine to coarse gravel, little silt, little brick fragments
	S-2	2'-4'	24	12	7-10 11-15		Moist, medium dense, dark grey, fine to coarse SAND, some fine gravel, little silt
	S-3	4'-6'	24	5	12-10 8-7		Moist, medium dense, brown, fine to coarse GRAVEL, little fine to coarse sand, trace clayey silt
	S-4	6'-8'	24	12	3-7 6-3		Moist, medium dense, brown, fine to coarse SAND, some fine gravel, little silt
	S-5	8'-10'	24	18	2-1 1-3		Wet, very loose, brown, fine to medium SAND and SILT
	S-6	10'-12'	24	22	3-4 6-5		Moist, medium dense, light brown, fine SAND, some silt
	S-7	12'-14'	24	24	4-4 8-8		Moist, medium dense, light brown, fine to medium SAND, some silt
	S-8	14'-16'	24	15	7-6 6-9		Moist, medium dense, brown, fine to medium SAND, little silt
	S-9	16'-18'	24	18	8-8 11-12		Moist, medium dense, brown, fine to coarse SAND, little silt
	S-10	18'-20'	24	15	7-4 7-9		Moist, medium dense, brown, fine to coarse SAND, trace silt

Driller: Pete LaBossiere Helper: Jack Lefebvre **Inspector: Jennifer Todd**

Remarks:

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

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Boring # CDM-102 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 3/16/2015 **Date End: 3/16/2015** **Location:** See Plan Sheet 2 of 2

Casing: HW Hammer: 300lb.	**Sampler:** S/S 140 lbs.	**Casing:** 4"ID Size: Fall:	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
3/16/15	**8.6'**	**20'**	

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
	S-11	24'-26'	24	7	9-8 7-8		Moist, medium dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt
	S-13	34'-34'7"	7	3	76-24/1"		Moist, very dense, light grey, fine GRAVEL, trace fine sand, trace silt
	S-13	36'-36'9"	9	4	79-21/3"		Moist, very dense, grey, fine GRAVEL, little silt, trace fine sand
							36'9" BOE

Driller: Pete LaBossiere	Helper: Jack Lefebvre	**Inspector: Jennifer Todd**

Remarks:

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

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Boring # CDM-103 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 1/15/2015 **Date End: 1/15/2015** **Location:** See Plan

Casing: HW Hammer: 300lb.	**Sampler:** S/S 140 lbs.	**Casing:** 4"ID Size: Fall:	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
1/15/15	--		

DP	S./#	DEPTH	PEN	REC	BLOWS/6"	S/C	SAMPLE DESCRIPTION
							12" Asphalt
	S-1	1'-1'3"	3	2	100/3"		Moist, very dense, grey, fine to coarse SAND, some fine gravel, some silt
	S-2	3'-5'	24	12	48-32 24-20		Moist, very dense, brown, fine to medium SAND, little fine gravel, trace silt
	S-3	5'-7'	24	6	17-16 11-9		Moist, medium dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt
	S-4	7'-9'	24	8	7-9 7-6		Moist, medium dense, brown, fine to coarse SAND, little fine gravel, little silt.
							Obstruction encountered at 7'6" bgs while driving casing to 9' bgs.

Driller: Ken Smith Helper: Dave Balsamo **Inspector: Jennifer Todd**

Remarks: **At 7'6" casing bouncing, hole relocated 5' west and redrilled**

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

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Boring # CDM-103 A **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 1/15/2015 **Date End: 1/15/2015** **Location:** See Plan

Casing: HW Hammer: 300lb.	**Sampler:** S/S 140 lbs.	**Casing:** 4"ID Size: Fall:	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
1/15/15	**12.5'**		

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
							Drilled directly to 9' bgs to continue sampling from CDM-103
	S-1	9'-11'	24	0	8-5 5-4		No Recovery
	S-2	11'-13'	24	12	2-4 5-8		Moist, stiff, tan, Clayey SILT and Fine SAND, little fine gravel
	S-3	13'-15'	24	22	10-12 12-13		TOP 12" Moist, very stiff, tan, Clayey SILT and fine SAND BOT 10" Moist, medium dense, brown, fine to medium SAND, little silt
	S-4	15'-17'	24	10	9-11 13-20		Moist, medium dense, brown, fine to coarse SAND, little silt
	S-5	17'-19'	24	12	17-18 16-13		Moist, dense, brown, fine to coarse SAND, little silt
	S-6	19'-21'	24	13	9-12 12-12		Moist, medium dense, brown, fine to coarse SAND, little silt
	S-7	25' - 27'	24	12	10-13 12-10		TOP 6" Wet, very stiff, brown, SILT and fine SAND BOT 6" Moist, medium dense, brown, fine to coarse SAND, little silt, little fine to coarse gravel
	S-8	30'-32'	24	16	17-31 26-49		Wet, very dense, fine to coarse GRAVEL, some silt, trace fine to coarse sand
	S-9	35'-35'5"	5	4	100/5"		Wet, very dense, fine to coarse GRAVEL, little silt, trace fine to coarse sand
							35'5" BOE

Driller: Ken Smith	Helper: Dave Balsamo	**Inspector: Jennifer Todd**

Remarks:

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

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Boring # CDM-105 **Project: CSO Lowell WWTP** **Project #: 127181**

Project Address: Pawtucket Street **City: Lowell** **State: MA** **Zip:**

Date Start: 1/20/2015 **Date End: 1/20/2015** **Location:** See Plan

Casing: HW Hammer: 300lb.	**Sampler:** S/S 140 lbs.	**Casing:** 4"ID Size: Fall:	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date:	**Depth:**	**Casing:**	**Stabilization Period**
1/20/15	**10'**		

DP	**S./#**	**DEPTH**	**PEN**	**REC**	**BLOWS/6"**	**S/C**	**SAMPLE DESCRIPTION**
	S-1	0-1'3"	15	15	18-70 40/3"		TOP 1" Moist, medium dense, fine SAND, little silt, trace grass and roots BOT 14" Moist, very dense, brown, fine to coarse SAND, some silt, little fine gravel
	S-2	5'-7'	24	7	9-9 4-4		Moist, medium dense, brown, fine to coarse SAND some silt, little fine gravel
	S-3	10'-12'	24	14	4-3 4-6		Wet, loose, grey, fine SAND and SILT
	S-4	15'-17'	24	14	7-4 4-10		Wet, loose, grey, fine SAND and SILT
	S-5	20'-22'	24	15	10-8 8-6		Wet, medium dense, grey, fine to medium SAND and SILT
	S-6	25'-27'	24	14	7-7 9-9		TOP 4" Wet, medium dense, fine to coarse SAND, some fine gravel, little silt BOT 10" Wet, medium dense, grey, fine to coarse SAND, little fine gravel, trace silt
	S-7	30'-32'	24	12	10-16 16-19		Wet, dense, grey, fine to coarse SAND, some silt, trace coarse gravel 32' BOE

Driller: Ken Smith	Helper: Dave Balsamo	**Inspector: Jennifer Todd**

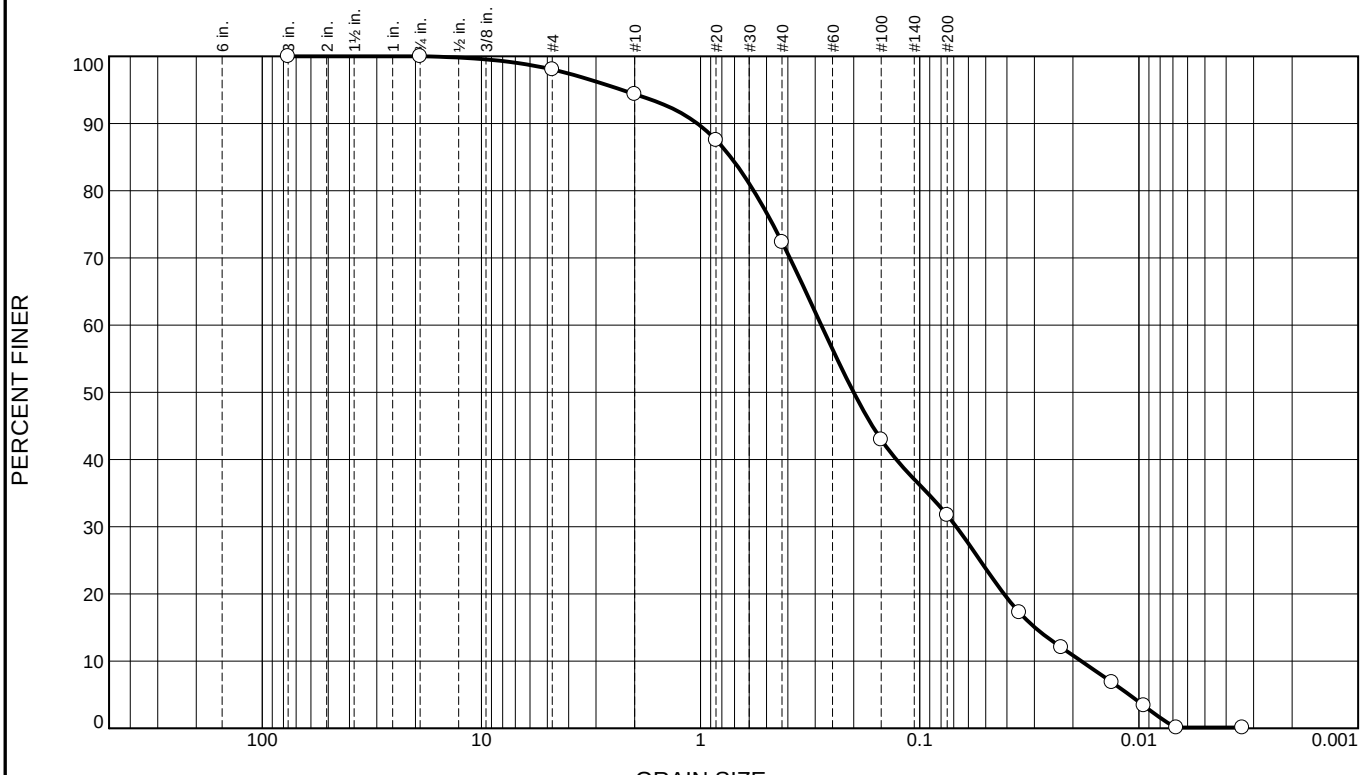
Remarks:

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

Appendix B

Boring Test Data and Monitoring Well - Marginal Sewer Relief Pipe

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.0	3.6	22.1	40.6	31.6	0.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	98.0		
#10	94.4		
#20	87.5		
#40	72.3		
#100	43.0		
#200	31.7		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0344 D_{85}= 0.7290 D_{60}= 0.2815
D_{50}= 0.2003 D_{30}= 0.0682 D_{15}= 0.0298
D_{10}= 0.0183 C_u= 15.35 C_c= 0.90

Classification

USCS= SM AASHTO=

Remarks

As received moisture content=20.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-101 **Depth:** 7-9
Sample Number: S-4 **Date:** 1/19/15

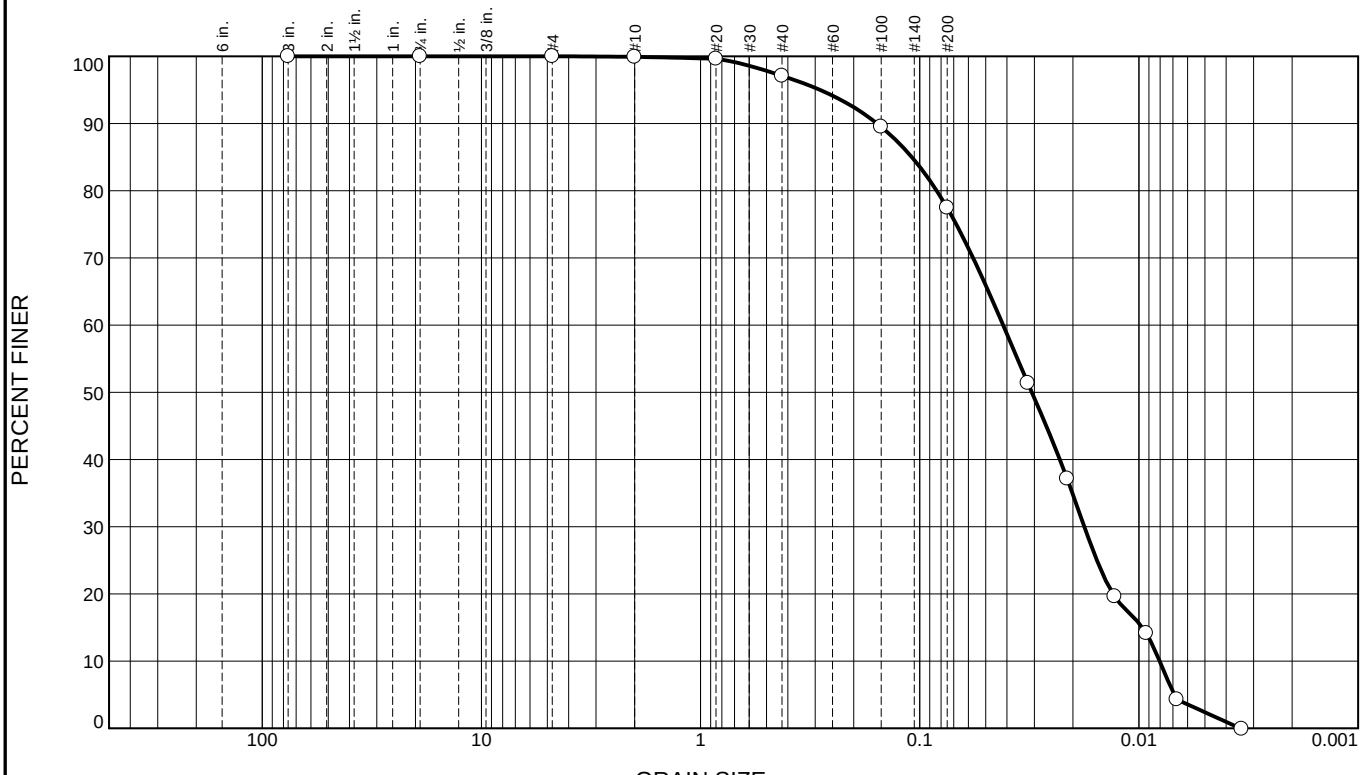
CDM Smith

Cambridge, Massachusetts

Client: Lowell Regional Wastewater Utility
Project: Decatur Avenue and Marginal Sewer
Project No: 552-107165 **Figure**

Tested By: JC **Checked By:** BFM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.8	19.6	75.1	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	100.0		
#10	99.9		
#20	99.6		
#40	97.1		
#100	89.5		
#200	77.5		

* (no specification provided)

Material Description

Lean clay with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1566 D_{85}= 0.1087 D_{60}= 0.0417
D_{50}= 0.0308 D_{30}= 0.0178 D_{15}= 0.0096
D_{10}= 0.0080 C_u= 5.18 C_c= 0.94

Classification

USCS= CL AASHTO=

Remarks

As received moisture content=34.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-101 **Depth:** 11-13
Sample Number: S-6 **Date:** 1/19/15

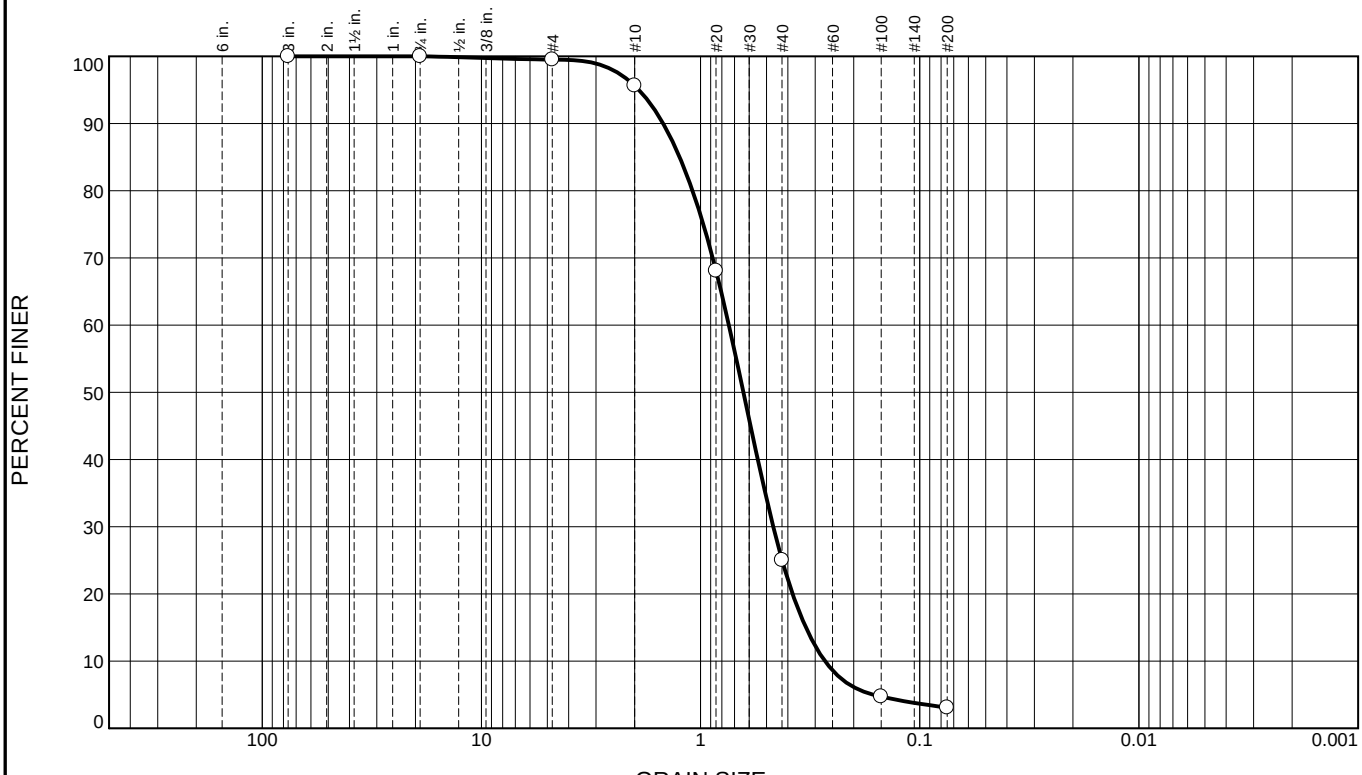
CDM Smith

Cambridge, Massachusetts

Client: Lowell Regional Wastewater Utility
Project: Decatur Avenue and Marginal Sewer
Project No: 552-107165 **Figure**

Tested By: JC **Checked By:** BFM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	3.9	70.6	21.9	3.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	99.5		
#10	95.6		
#20	68.1		
#40	25.0		
#100	4.7		
#200	3.1		

* (no specification provided)

Material Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.4819 D_{85}= 1.2464 D_{60}= 0.7431
D_{50}= 0.6379 D_{30}= 0.4661 D_{15}= 0.3310
D_{10}= 0.2707 C_u= 2.75 C_c= 1.08

Classification

USCS= SP AASHTO=

Remarks

As received moisture content=18.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-101 **Depth:** 15-17
Sample Number: S-8 **Date:** 1/19/15

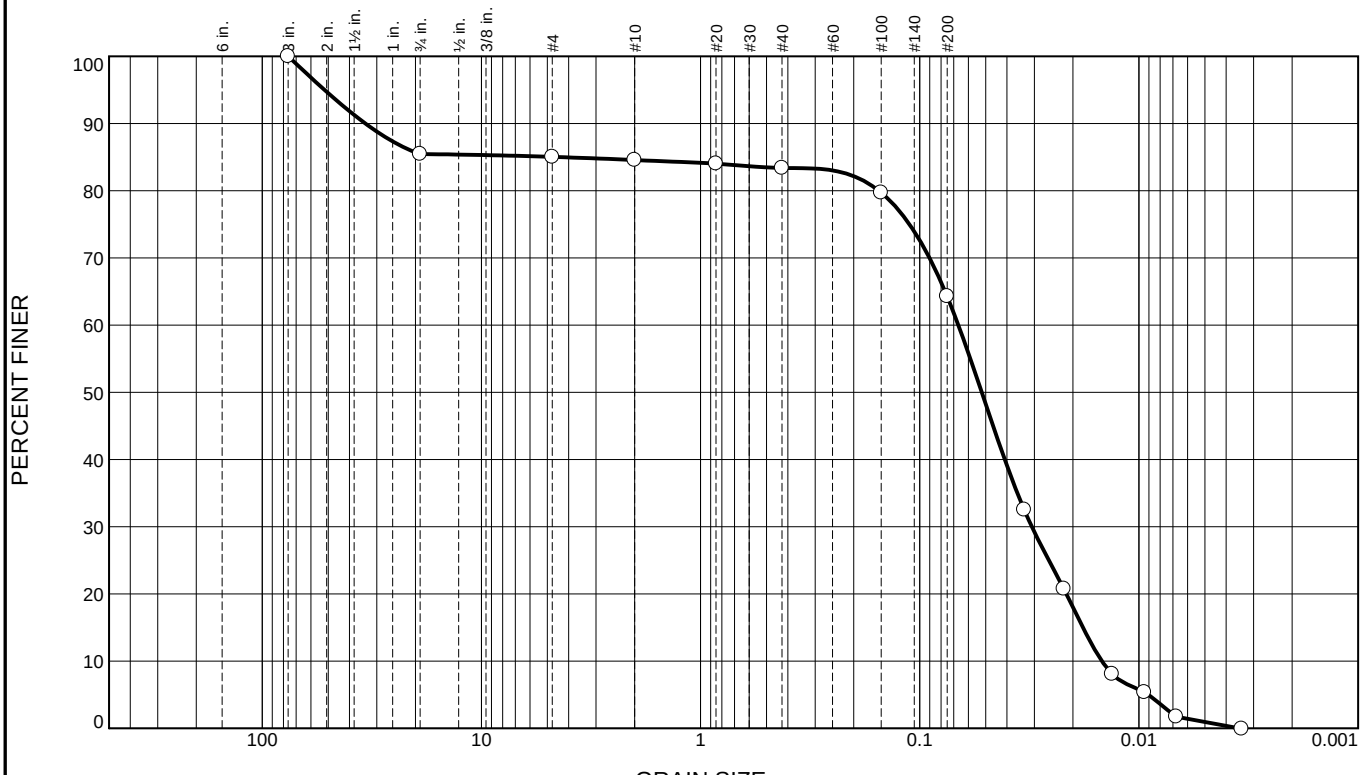
CDM Smith

Cambridge, Massachusetts

Client: Lowell Regional Wastewater Utility
Project: Decatur Avenue and Marginal Sewer
Project No: 552-107165 **Figure**

Tested By: JC **Checked By:** BFM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.5	0.5	0.4	1.2	19.1	63.4	0.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	85.5		
#4	85.0		
#10	84.6		
#20	84.0		
#40	83.4		
#100	79.7		
#200	64.3		

* (no specification provided)

Material Description

Sandy lean clay with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 33.8595 D_{85}= 4.4188 D_{60}= 0.0667
D_{50}= 0.0522 D_{30}= 0.0308 D_{15}= 0.0180
D_{10}= 0.0148 C_u= 4.52 C_c= 0.96

Classification

USCS= CL AASHTO=

Remarks

As received moisture content=26.7%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-103B **Depth:** 11-13
Sample Number: S-2 **Date:** 1/15/15

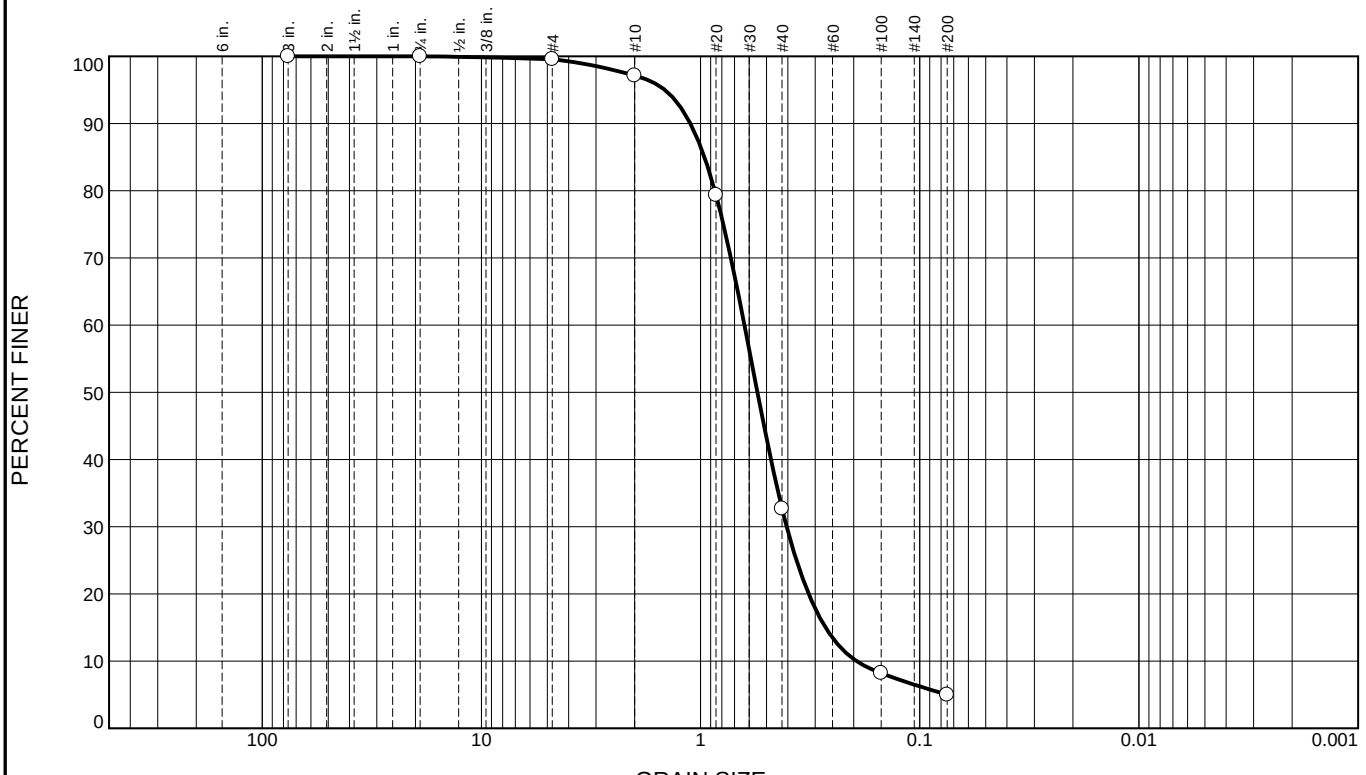
CDM Smith

Cambridge, Massachusetts

Client: Lowell Regional Wastewater Utility
Project: Decatur Avenue and Marginal Sewer
Project No: 552-107165 **Figure**

Tested By: JC **Checked By:** BFM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	2.5	64.4	27.7	5.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	99.6		
#10	97.1		
#20	79.4		
#40	32.7		
#100	8.2		
#200	5.0		

* (no specification provided)

Material Description

Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1136 D_{85}= 0.9598 D_{60}= 0.6310
D_{50}= 0.5504 D_{30}= 0.4049 D_{15}= 0.2693
D_{10}= 0.1943 C_u= 3.25 C_c= 1.34

Classification

USCS= SP-SM AASHTO=

Remarks

As received moisture content=18.4%
Fines classifcation and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-103B **Depth:** 17-19
Sample Number: S-5 **Date:** 1/15/15

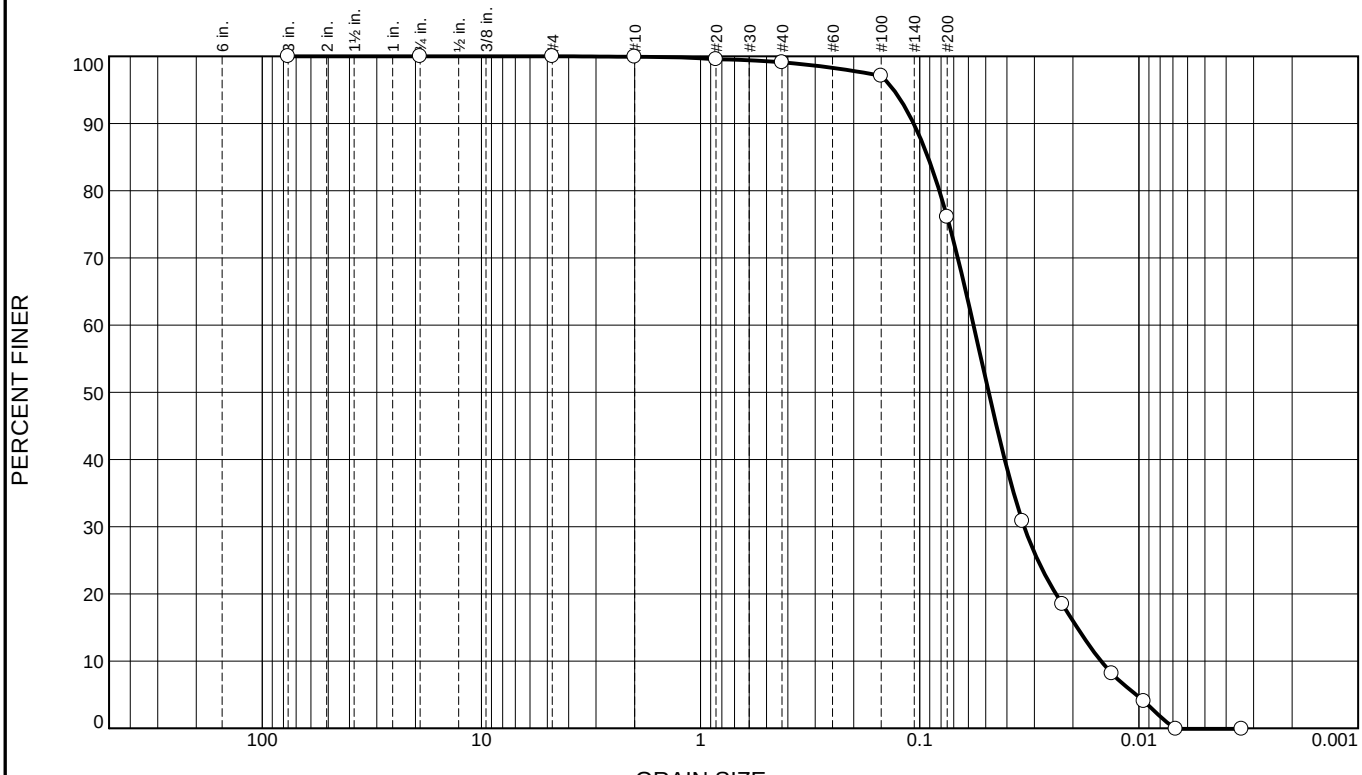
CDM Smith

Cambridge, Massachusetts

Client: Lowell Regional Wastewater Utility
Project: Decatur Avenue and Marginal Sewer
Project No: 552-107165 **Figure**

Tested By: JC **Checked By:** BFM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.8	23.0	76.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	100.0		
#10	99.9		
#20	99.5		
#40	99.1		
#100	97.1		
#200	76.1		

* (no specification provided)

Material Description

Lean clay with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1066 D_{85}= 0.0918 D_{60}= 0.0568
D_{50}= 0.0485 D_{30}= 0.0334 D_{15}= 0.0191
D_{10}= 0.0149 C_u= 3.82 C_c= 1.32

Classification

USCS= CL AASHTO=

Remarks

As received moisture content=29.7%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

Source of Sample: CDM-105 **Depth:** 10-12
Sample Number: S-3 **Date:** 1/20/15

CDM Smith

Cambridge, Massachusetts

Client: Lowell Regional Wastewater Utility
Project: Decatur Avenue and Marginal Sewer
Project No: 552-107165 **Figure**

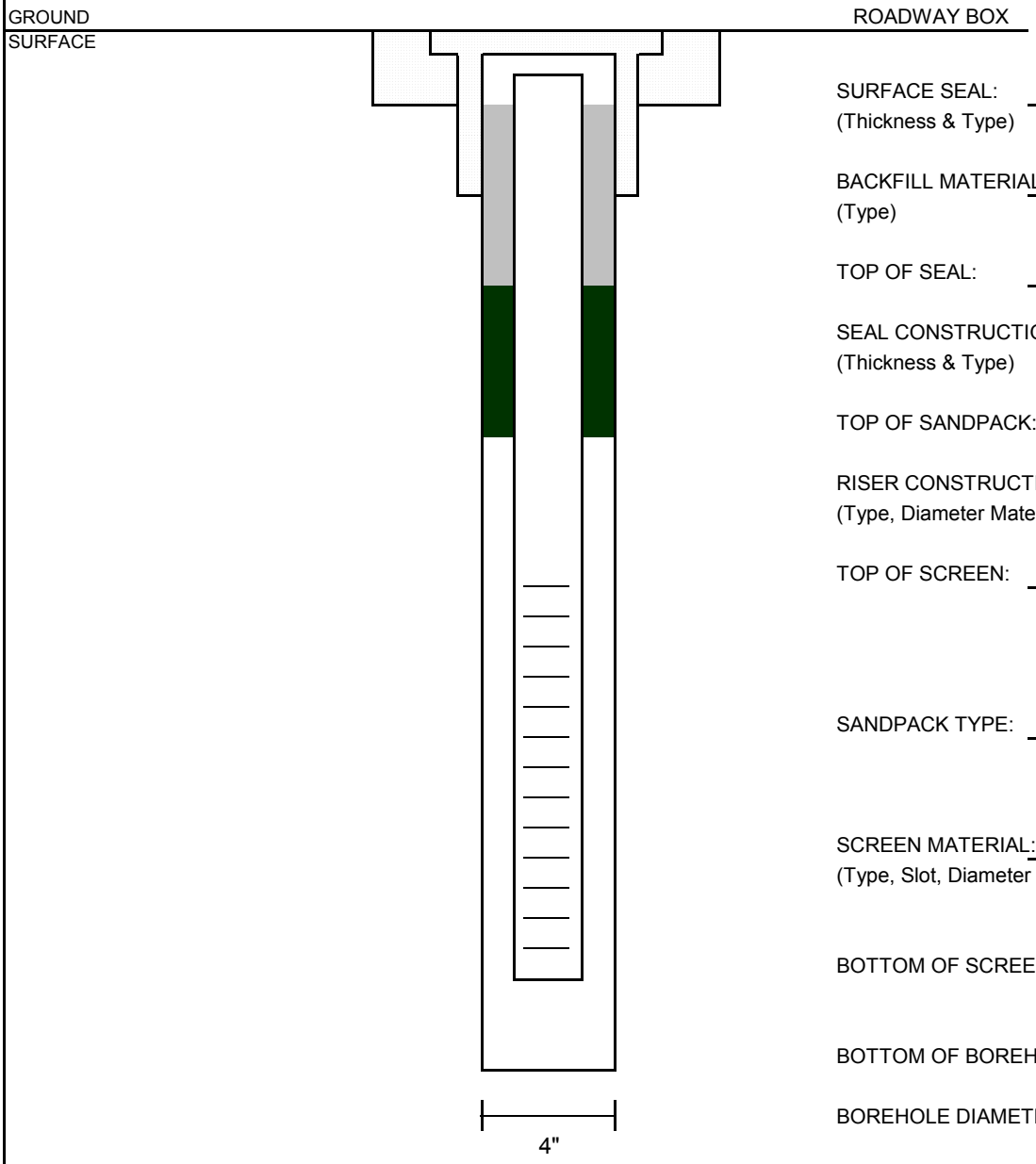
Tested By: JC **Checked By:** BFM

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Installation Log

Client:	Lowell Regional Wastewater Utility, MA	Contractor:	NEBC	Boring/Well No.:	CDM-101(MW)
Project Name:	Decatur Ave & Marginal Sewer	Driller:	Ken Smith	Date Installed:	1/19/2015
Project Location:	Lowell, MA	Ground EL:		Logged By:	Jennifer Todd
Project Number:	0552-107165	Riser EL:		Page:	1 of 2



SURFACE SEAL: (Thickness & Type)	1', Concrete
BACKFILL MATERIAL: (Type)	Sand and cuttings
TOP OF SEAL:	6' bgs
SEAL CONSTRUCTION: (Thickness & Type)	2', Bentonite
TOP OF SANDPACK:	8' bgs
RISER CONSTRUCTION: (Type, Diameter Material)	PVC, 2" dia
TOP OF SCREEN:	10' bgs
SANDPACK TYPE:	1S Silica Sand
SCREEN MATERIAL: (Type, Slot, Diameter Material)	PVC, 10 slot, 2" dia
BOTTOM OF SCREEN:	20' bgs
	Backfilled with cuttings
BOTTOM OF BOREHOLE:	30' bgs
BOREHOLE DIAMETER:	4"

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks: Top of riser is 3" below ground surface.

CDM Smith

75 State Street
Boston, MA 02109
(617)-452-6000

Monitoring Well Report

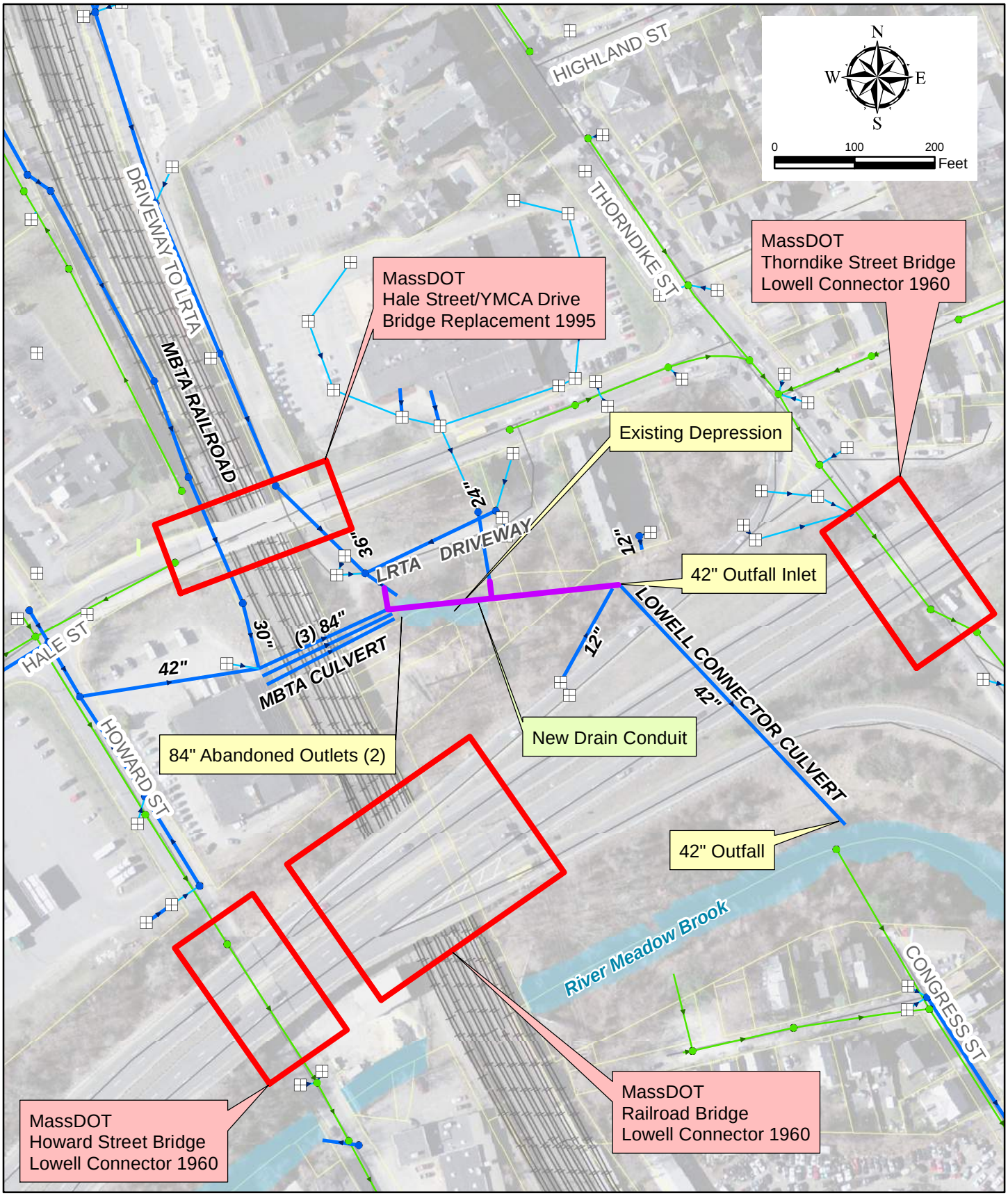
Client:	Lowell Regional Wastewater Utility, MA		
Project Name:	Decatur Ave & Marginal Sewer	Ground Surface EL:	Boring/Well No. CDM-101(MW)
Project Location	Lowell, MA	Riser EL:	Page: 2 of 2
Project Number:	0552-107165		

Date	Time	Elapsed Time (days)	Depth of Water From Top of Riser (ft)	Elevation of Water (ft)	Remarks	Read By
1/19/2015	12:30 PM	0	8'1"			Jennifer Todd
3/16/2015	7:15 AM	56	8.4'			Jennifer Todd

Remarks:

Appendix C

LRTA Geotechnical Record Information



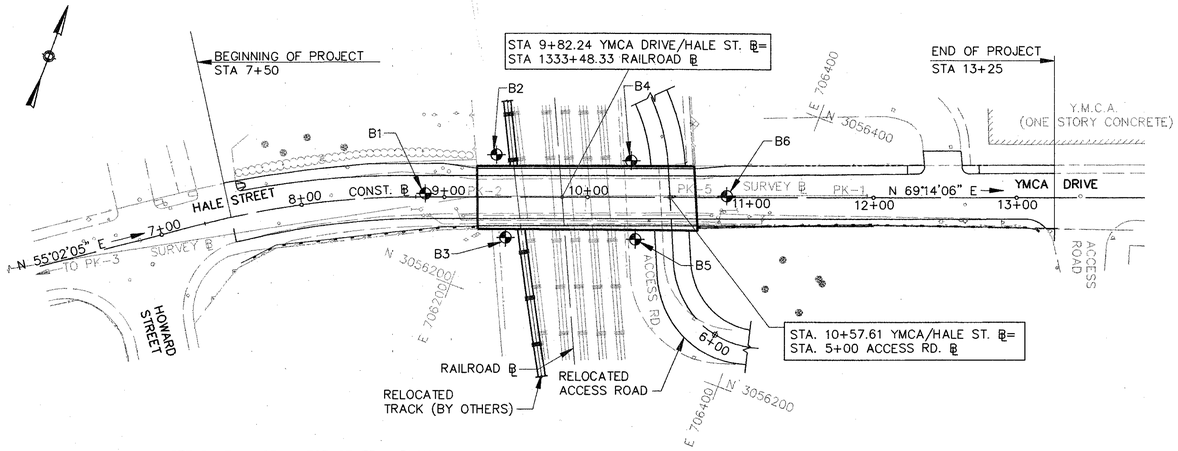
Lowell, Massachusetts

Legend

- Existing Drain
- Existing Sewer
- Existing Catch Basin
- New Drain Conduit

Figure:
LRTA Geotechnical Record Information Overview

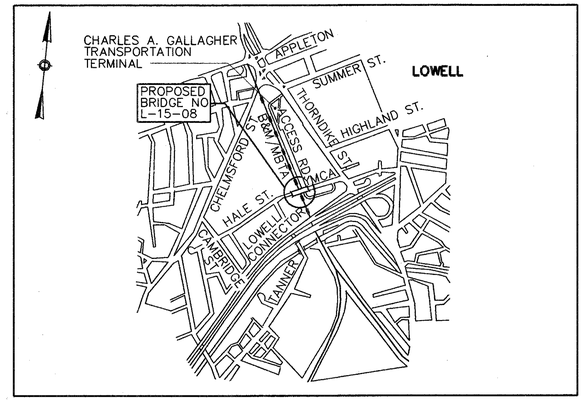
STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
MASS.		1995	11	33
PROJECT FILE NO. 600640				



SEE SHEET 5 OF 18 FOR GENERAL PLAN

KEY PLAN

SCALE : 1"=50'-0"



LOCUS PLAN

SCALE: 1"=400'±

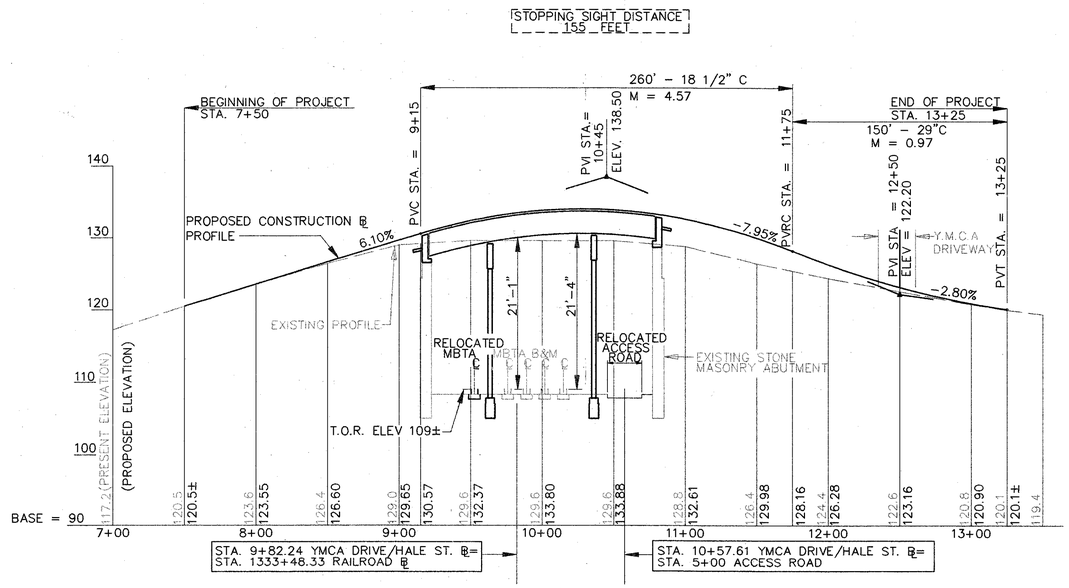
INDEX TO DRAWINGS

TITLE SHEET	1
BORINGS	2
BORINGS	3
GENERAL NOTES	4
GENERAL PLAN	5
DEMOLITION PLAN	6
GENERAL PLAN AND SECTION	7
WEST ABUTMENT	8
EAST ABUTMENT	9
MISCELLANEOUS DETAILS	10
PIER DETAILS	11
FRAMING PLAN	12
STRUCTURAL STEEL DETAILS	13
DECK DETAILS	14
MISCELLANEOUS DETAILS	15
END POST DETAILS	16
METAL BRIDGE RAIL	17–18

ESTIMATED QUANTITIES

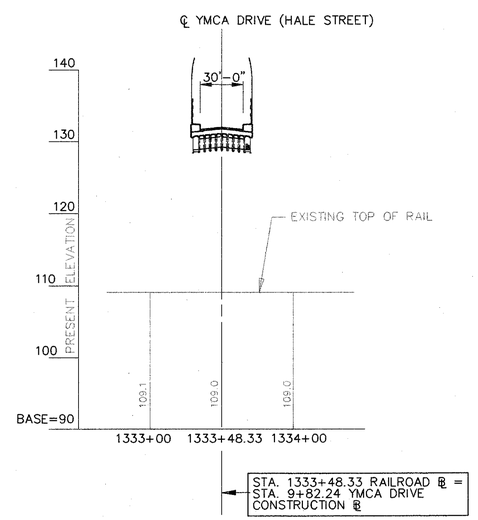
(NOT GUARANTEED)

CLEAN AND PAINT STEEL BRIDGE	1 L.S.
DEMOLITION OF BRIDGE SUBSTRUCTURE, BRIDGE NO. L-15-08	1 L.S.
DEMOLITION OF BRIDGE SUPERSTRUCTURE, BRIDGE NO. L-15-08	1 L.S.
BRIDGE EXCAVATION	450 C.Y.
CLASS B. ROCK EXCAVATION	36 C.Y.
GRAVEL BORROW	30 C.Y.
4000 psi, 1 1/2", 565 CEMENT CONCRETE MASONRY	120 C.Y.
4000 psi, 3/4", 610 CEMENT CONCRETE MASONRY	110 C.Y.
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	7800 LBS.
CORING AND GROUTING DOWELS	850 EA.
BRIDGE STRUCTURE (BRIDGE NO. L-15-08)	1 L.S.



PROFILE–YMCA DRIVE / HALE STREET

HORIZONTAL SCALE : 1"=50'-0"
VERTICAL SCALE : 1"=10'-0"



PROFILE–B&M/MBTA RAILROAD

HORIZONTAL SCALE : 1"=50'-0"
VERTICAL SCALE : 1"=10'-0"

06-26-96	SHEET 11A ADDED ALTERNATE DESIGN FOR PIER NO.1
December 24, 1994	ISSUED FOR CONSTRUCTION

FREDERIC R. HARRIS, INC.
66 LONG WHARF
BOSTON, MA.

MASS HIGHWAY

PROPOSED BRIDGE
LOWELL
YMCA DRIVE (HALE STREET)
OVER B&M/MBTA RAILROAD

THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS HIGHWAY DEPARTMENT
10 PARK PLAZA BOSTON, MASS.

Andrew C. Dariopulos — BRIDGE ENGINEER
Paul B. Cooke, P.E. — CHIEF ENGINEER

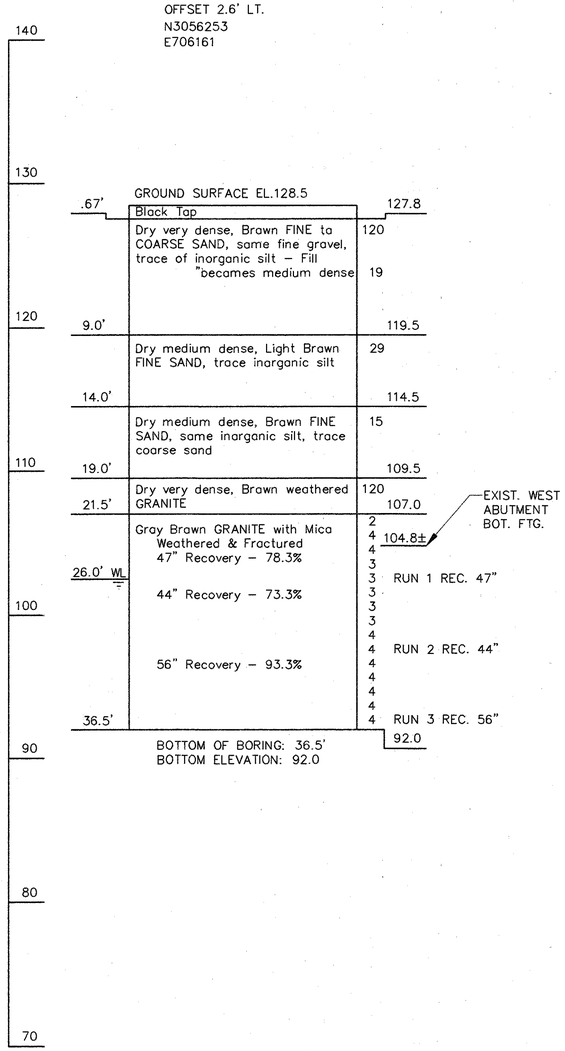
SHEET 1 OF 18 SHEETS BRIDGE NO L-15-08 (2N3)

DWG = J:\PROJECTS\2573\S05\11 UNITS = Dec.
PLOT SCALE: 1"= 50' DATE 12/09/94 TIME 14:57

STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
MASS.		1995	12	33
PROJECT FILE NO. 600640				

B-1

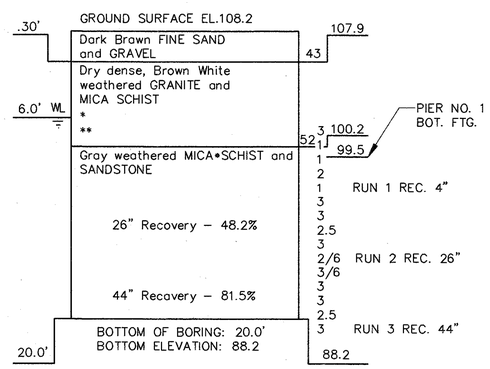
STA. 8+86.7
OFFSET 2.6' LT.
N3056253
E706161



WATER LEVEL: 26.0' (3-8-94 AM)
BORING STARTED: 3/7/94 – 9:30 AM
BORING FINISHED: 3/8/94 – 10:00 AM
TOTAL HOURS: 10.5
FOREMAN: G. BROUILLETTE
INSPECTOR: S. LEISEY

B-2

STA. 9+36.4
OFFSET 29.6' LT
N3056296
E706198



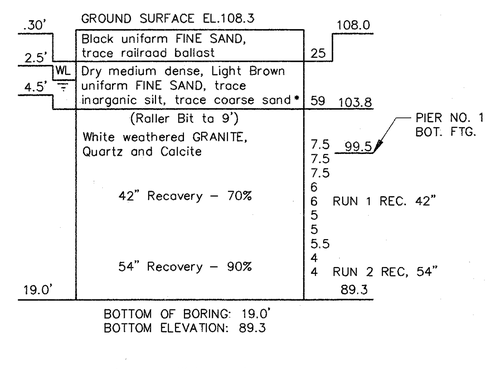
* becomes Wet very dense

** Piece of AGGREGATE wedged in Core Bit – No recovery on Core
4" Recovery– 6.7%

WATER LEVEL: 6.0' (10-18-94 PM)
BORING STARTED: 10/18/94 – 8:00 AM
BORING FINISHED: 10/18/94 – 12:30 PM
TOTAL HOURS: 4.5
FOREMAN: C. O'DONNELL
INSPECTOR: S. LEISEY

B-3

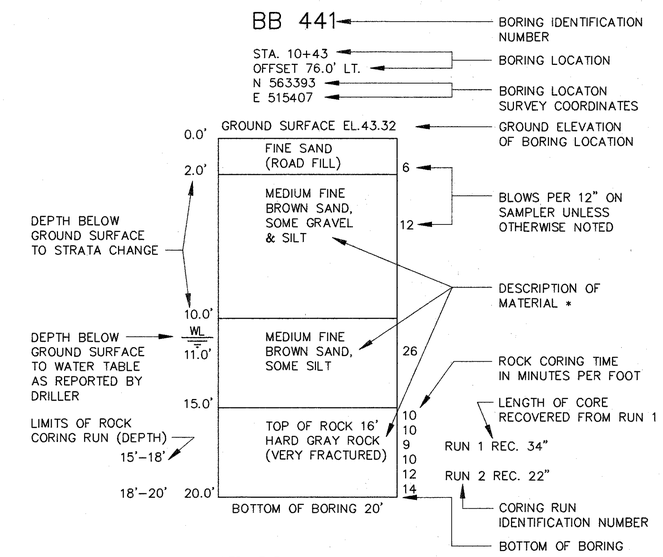
STA. 9+42.7
OFFSET 27.9' RT
N3056245
E706225



* becomes Wet very dense

WATER LEVEL: 2.5' (10-17-94 PM)
BORING STARTED: 10/17/94 – 10:00 AM
BORING FINISHED: 10/17/94 – 2:30 PM
TOTAL HOURS: 4.5
FOREMAN: C. O'DONNELL
INSPECTOR: S. LEISEY

LEGEND:



WATER LEVEL:
BORING STARTED:
BORING FINISHED:
COMPLETION TIME:
FOREMAN:
INSPECTOR:

* PROPORTIONS USED IN SOIL DESCRIPTION:

AND – 40 TO 50%
SOME – 10 TO 40%
TRACE – 0 TO 10%

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON PLAN THUS: ⊕ B1
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER 12" WITH A 140 POUND WEIGHT FALLING 30 INCHES.
5. BORING SAMPLES MAY BE SEEN AT THE RESEARCH AND MATERIALS DIVISION, 400 D STREET, SOUTH BOSTON, MA.
6. BORINGS B1 AND B6 WERE MADE IN MARCH 1994. BORINGS B2, B3, B4, AND B5 WERE MADE IN OCTOBER 1994.
7. BORINGS WERE MADE BY: GUILD DRILLING CO., INC. 100 WATER STREET, PROVIDENCE, R.I.
8. ELEVATIONS ARE BASED UPON THE NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD).
9. THE DEPTHS AS SHOWN ON THE ORIGINAL BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER.

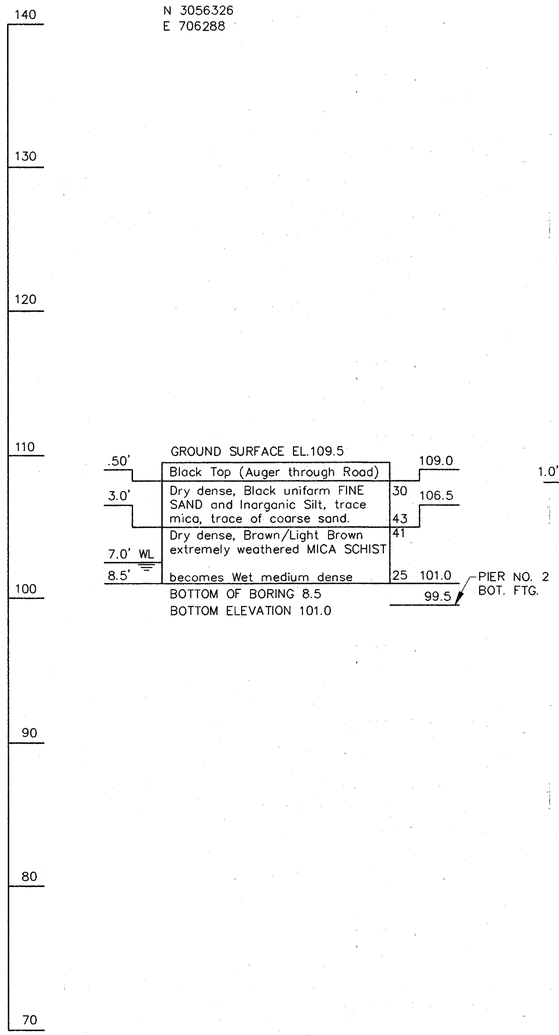
DATE	DESCRIPTION
12/24/94	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

DWG = J:\PROJECTS\25723\S06L12 UNITS = Dvc
PLOT SCALE: 1"= 1' DATE 12/08/94 TIME 10:02

STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
MASS.		1995	13	33
PROJECT FILE NO. 600640				

B-4

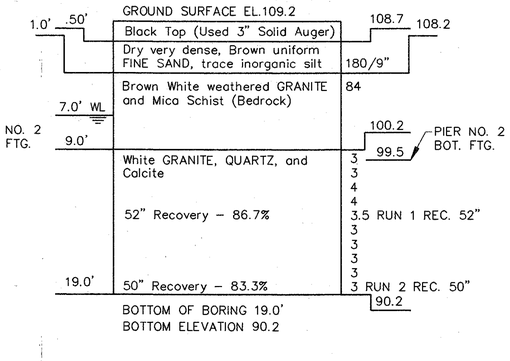
STA. 10+30.6
OFFSET 25.4' LT
N 3056326
E 706288



WATER LEVEL: 7.0'(10-19-94 PM)
BORING STARTED: 10/19/94 - 7:30 AM
BORING FINISHED: 10/19/94 - 9:00 AM
TOTAL HOURS: 1.5
FOREMAN: C. O'DONNELL
INSPECTOR: S. LEISEY

B-5

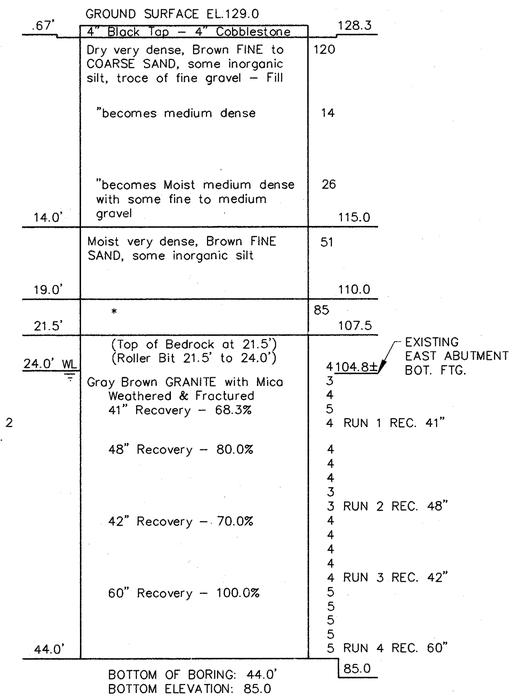
STA. 10+33.3
OFFSET 29.1' RT
N 3056276
E 706310



WATER LEVEL: 7.0' (10-19-94 PM)
BORING STARTED: 10/19/94 - 9:30 AM
BORING FINISHED: 10/19/94 - 12:30 PM
TOTAL HOURS: 3.0
FOREMAN: C. O'DONNELL
INSPECTOR: S. LEISEY

B-6

STA. 10+97.3
OFFSET 1.2' LT.
N3056327
E706358

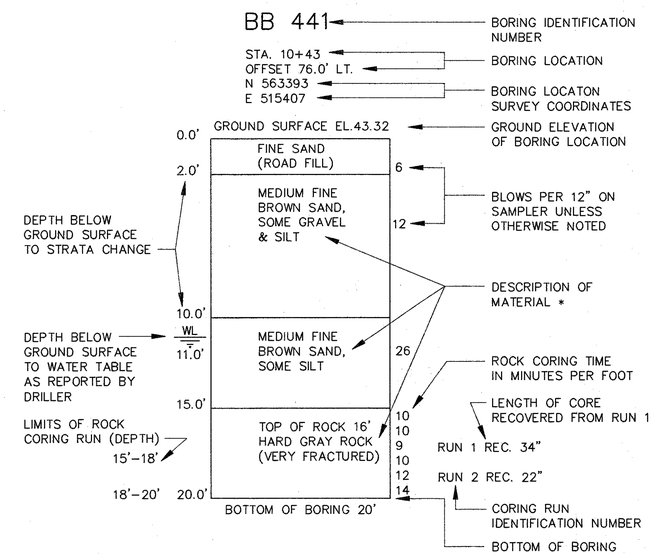


* Moist very dense, Brown FINE to COARSE SAND and fine to medium Gravel, trace inorganic silt

NOTE: Refusal at 24.0' - 120 Blows
No Penetration

WATER LEVEL: 24.0' (3-2-94 AM)
BORING STARTED: 3/1/94 - 10:00 AM
BORING FINISHED: 3/2/94 - 12:00 PM
TOTAL HOURS: 10
FOREMAN: G. BROUILLETTE
INSPECTOR: S. LEISEY

LEGEND:



WATER LEVEL:
BORING STARTED:
BORING FINISHED:
COMPLETION TIME:
FOREMAN:
INSPECTOR:

* PROPORTIONS USED IN SOIL DESCRIPTION:

AND - 40 TO 50%
SOME - 10 TO 40%
TRACE - 0 TO 10%

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON PLAN THUS: ⊕ B1
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
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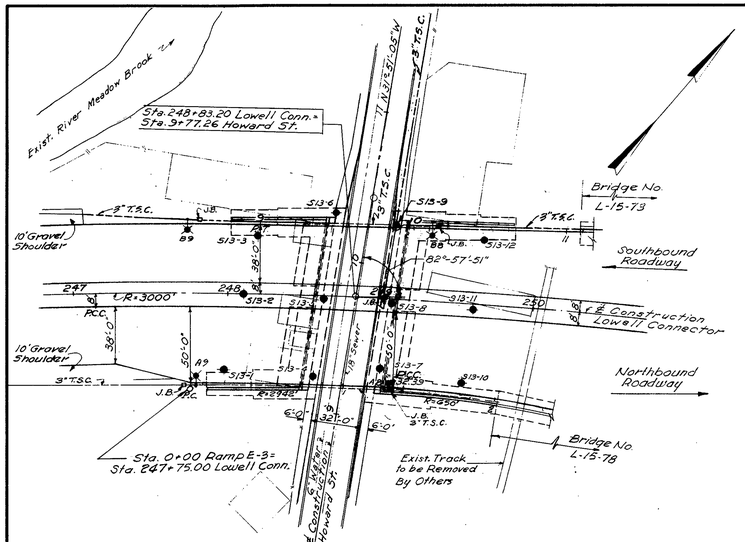
5. BORING SAMPLES MAY BE SEEN AT THE RESEARCH AND MATERIALS DIVISION, 400 D STREET, SOUTH BOSTON, MA.
6. BORINGS B1 AND B6 WERE MADE IN MARCH 1994. BORINGS B2, B3, B4, AND B5 WERE MADE IN OCTOBER 1994.
7. BORINGS WERE MADE BY: GUILD DRILLING CO., INC.
   100 WATER STREET
   E. PROVIDENCE, RI.
8. ELEVATIONS ARE BASED UPON THE NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD).
9. THE DEPTHS AS SHOWN ON THE ORIGINAL BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER.

DATE	DESCRIPTION
12/24/94	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

DWG = J:\PROJECTS\2573\50613 UNITS = Dec.
PLOT SCALE: 1" = 1 DATE: 12/28/94 TIME: 6:28

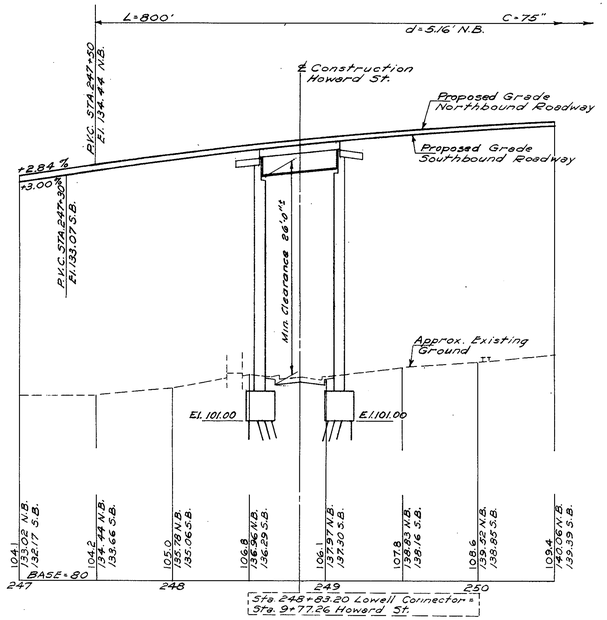
HIGHWAY CKD. BY: [illegible] DATE: [illegible]
STRUCTURE CKD. BY: [illegible] DATE: 2-27-60

PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.	U-358(7)		98	277



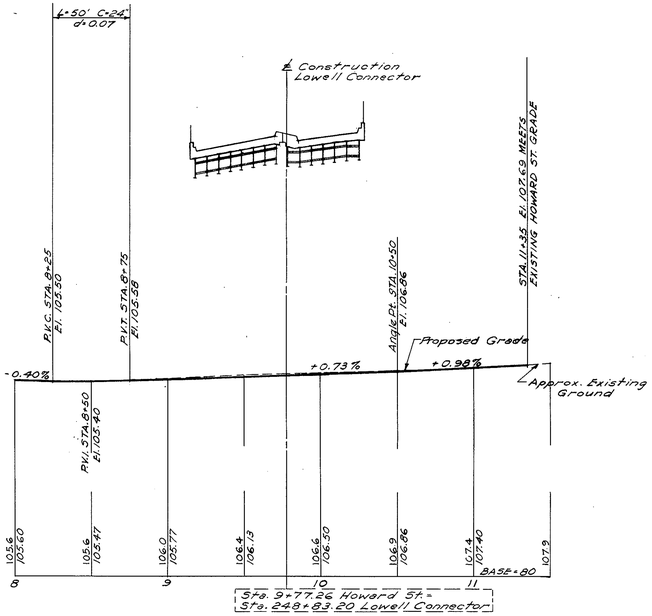
KEY PLAN

SCALE: 1"=40'



PROFILE - LOWELL CONNECTOR

SCALES: HORIZ. 1"=40' VERT. 1"=8'



PROFILE - HOWARD ST.

SCALES: HORIZ. 1"=40' VERT. 1"=8'

ESTIMATED QUANTITIES

(NOT GUARANTEED)

Bridge Structure (L-15-76)	1	L.S.
Bridge Excavation	2020	C.Y.
Class "B" Rock Excavation	80	C.Y.
Gravel Borrow	7460	C.Y.
Class I Bit. Conc. Pave. Type I-1	80	Tons
Class "G" Cement Conc. Masonry	90	C.Y.
Steel Piles (12 BP53)	5100	L.F.
Steel Pile Splices (12 BP53)	10	Ea.
Under bridge Lighting (L-15-76)	1	L.S.

Included Under Bridge Structure (L-15-76)

Steel Reinforcement For Structures	316,000 Lbs.
Structural Steel	129,000 Lbs.

GENERAL NOTES

FOUNDATIONS

Foundations May Be Altered, If Necessary, To Suit Conditions Encountered During Construction.

DATE & SEAL

To Be Placed On Inside Faces of Southeasterly And Northwesterly End Posts As Shown In Detail On Sheet 11. A Sheet Showing Size And Character Of Numerals Will Be Furnished. Seal Will Be Furnished By The Commonwealth And Shall Be Placed By The Contractor.

DESIGN

In Accordance With The Current Specifications Of The American Association Of State Highway Officials 1957 For H20-S16-44 Loading (Modified For Military Loading)

REINFORCEMENT

All Bars Shall Have Deformations Conforming To A.S.T.M. Designation A-305. Unless Otherwise Shown On Plans, Reinforcing Bars Shall Be Lapped 20 Diameters To Make A Splice, Except That Main Reinforcing Bars Near The Top Of Slabs And Beams Having More Than 12 Inches Of Concrete Under The Bars Shall Be Lapped 35 Diameters To Make A Splice.

DATUM

Datum El. 0.00 Refers To U.S.C. & G.S. M.S.L. Of 1929.

BENCH MARK

Sta. 249+42± - Lt. 414'± Howard St. Top Seat @ N.E. Corner Bridge Over R.M.B. Elev. 109.49.

INDEX OF SHEETS

SHEET	TITLE
1	TITLE SHEET
2	BORING DATA
3	BORING DATA
4	GENERAL PLAN & ELEVATION
5	FOUNDATION PLAN
6	PLAN WESTERLY ABUTMENT
7	PLAN EASTERLY ABUTMENT
8	ELEV. OF ABUTMENTS
9	WINGWALLS
10	TRANSVERSE SECTION
11	TYPICAL CONCRETE DETAILS
12	FRAMING PLAN
13	TYPICAL STEEL DETAILS

EDWARDS AND KELCEY
ENGINEERS AND CONSULTANTS
BOSTON, MASS.

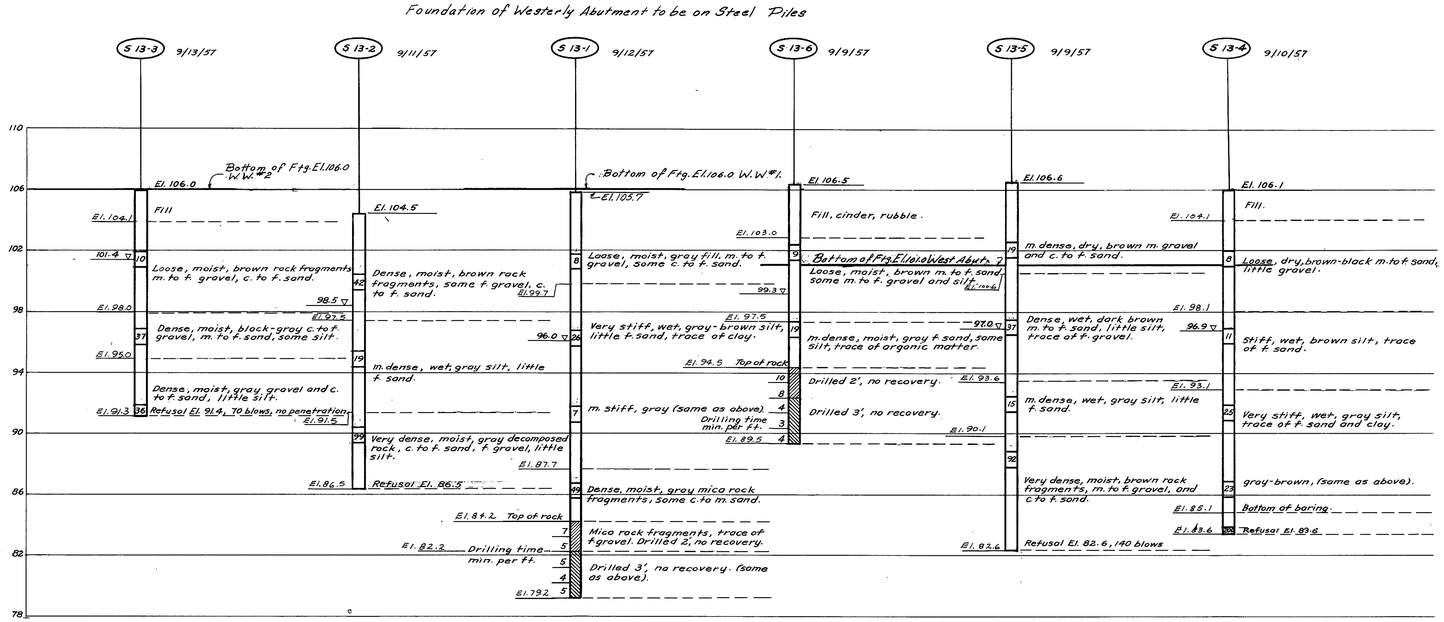
FEB. 13, 1961	⚠ SHEET #8 - ELEVATIONS - REVISED AND ADDED
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

THE COMMONWEALTH OF MASSACHUSETTS
PROPOSED BRIDGE
LOWELL
LOWELL CONNECTOR
OVER HOWARD STREET
SCALES AS NOTED

OFFICE OF
DEPARTMENT OF PUBLIC WORKS
100 NASHUA ST. BOSTON, MASS.
JUNE 1960

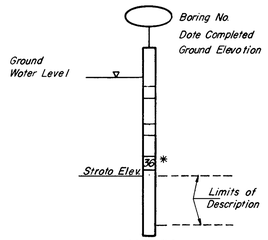
BRIDGE ENGINEER — CHIEF ENGINEER

PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS	U-358 (7)		99	277



BORING DATA

Scale: 1/4" = 1'-0"



LEGEND

BORING NOTES

Location of Borings Shown On Key Plan Thus: S13-1. Borings Taken For Purpose Of Design Only, And Show Conditions At Boring Points Only, But Do Not Necessarily Show Nature Of Materials To Be Encountered During Construction.

*-Indicates Blow Per Ft. On 2" O.D. Split Spoon Produced By 30" Fall Of 140# Hammer.

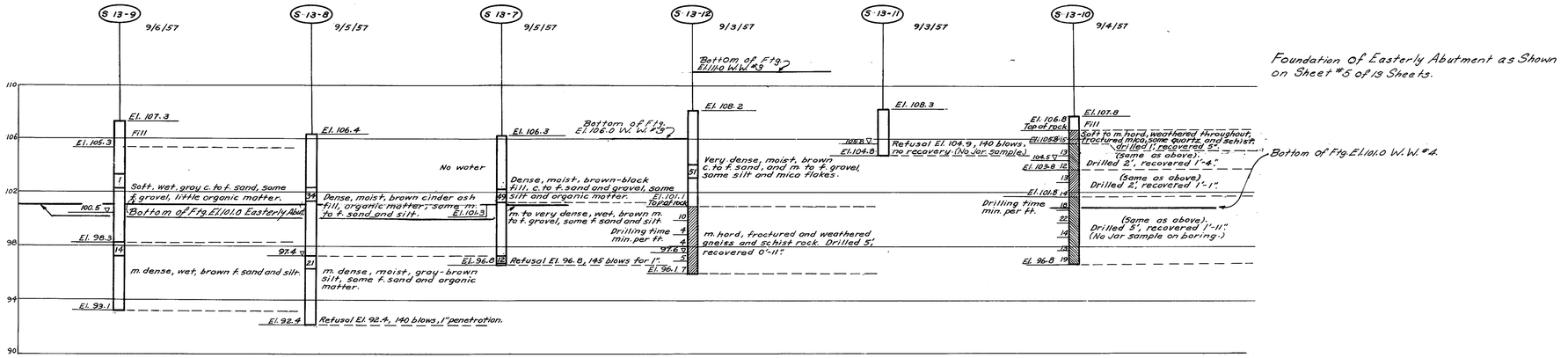
All Borings Were Made Between August And November 1957 By American Drilling Co., Inc. East Providence, R. I.

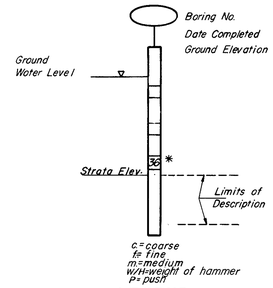
Boring Samples May Be Seen At The Department Of Public Works' Laboratory In The Maintenance Building On Rte. 9 In Wellesley.

DATE	DESCRIPTION
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

USE ONLY PRINTS OF LATEST DATE

PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.	U-358(7)		100	277





LEGEND

BORING NOTES

Location of Borings Shown On Key Plan Thus ● S13-1, Borings Taken For Purpose Of Design Only, And Show Conditions At Boring Points Only, But Do Not Necessarily Show Nature Of Materials To Be Encountered During Construction.

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Boring Samples May Be Seen At The Department Of Public Works' Laboratory In The Maintenance Building On Rte. 9 In Wellesley.

BORING DATA

Scale 1/4" = 1'-0"

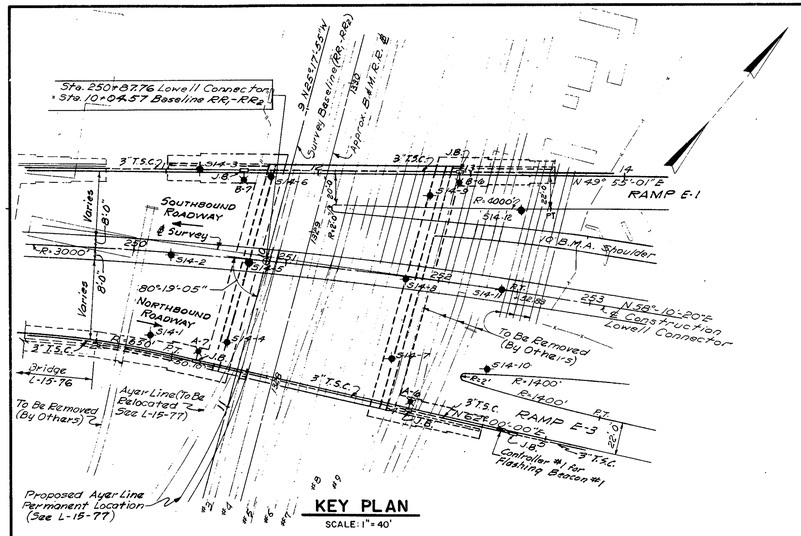
DATE	DESCRIPTION
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

USE ONLY PRINTS OF LATEST DATE

PUB.RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.	U-358(7)		117	277

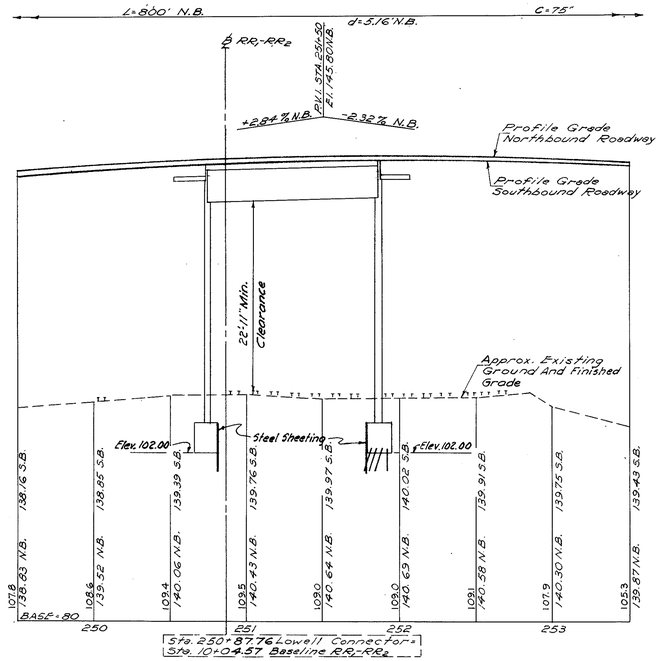
HIGHWAY
CKD. BY:
DATE:

STRUCTURE
CKD. BY: WH
DATE: 2-18-60



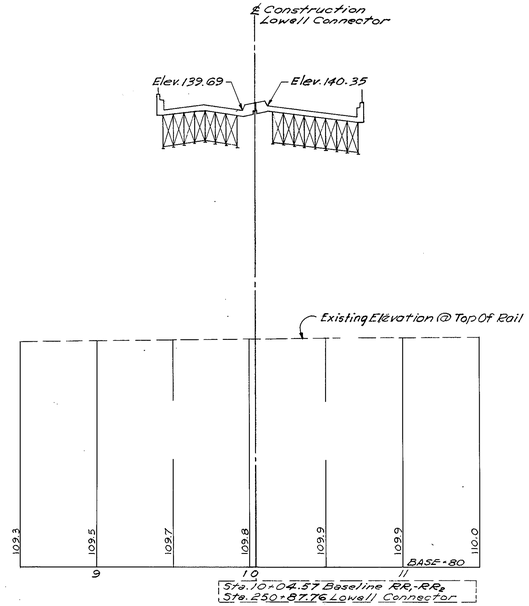
KEY PLAN

SCALE: 1" = 40'



LOWELL CONNECTOR

SCALES: HOR. 1" = 40'
VERT. 1" = 8'



B.&M. R.R. AT STA. 250+87.76 (LOWELL CONN.)

SCALES: HOR. 1" = 40'
VERT. 1" = 8'

ESTIMATED QUANTITIES

(Not Guaranteed)

Bridge Structure (L-15-78)	1	Lump Sum
Bridge Excavation	2,900	C.Y.
Class B Rock Excavation	280	C.Y.
Gravel Borrow	7,080	C.Y.
Class I Bit. Conc. Pavement Type I-1	260	Tons
Steel Sheeting	50,000	Lbs.
Class G Cement Concrete Masonry	40	C.Y.
Steel Piles (12 BP 53)	4,200	L.F.
Steel Pile Splices (12 BP 53)	4	Each

INCLUDED UNDER BRIDGE STRUCTURE (L-15-78)
(Quantities Not Guaranteed)

Steel Reinforcement For Structures	947,000	Lbs.
Structural Steel	890,000	Lbs.

GENERAL NOTES

FOUNDATIONS

Foundations May Be Altered, If Necessary, To Suit Conditions Encountered During Construction.

DATE & SEAL

To Be Placed On Inside Face of Northwesterly End Post As Shown In Detail On Sheet 10 A Sheet Showing Size And Character Of Numerals Will Be Furnished. Seal Will Be Furnished By The Commonwealth And Shall Be Placed By The Contractor.

DESIGN

In Accordance With The Current Specifications Of The American Association Of State Highway Officials 1957 For H20-S16-44 Loading.

REINFORCEMENT

All Bars Shall Have Deformations Conforming To A.S.T.M. Designation A-305. Unless Otherwise Shown On Plans, Reinforcing Bars Shall Be Lapped 20 Diameters To Make A Splice, Except That Main Reinforcing Bars Near The Top Of Slabs And Beams Having More Than 12 Inches Of Concrete Under The Bars Shall Be Lapped 35 Diameters To Make A Splice.

DATUM

Datum El. 0.00 Refers To U.S.C. & G.S. M.S.L. Of 1929.

BENCH MARK

N.W. Bolt On Low Signal Light West Of Tracks Sta. 250+90± Left 20' Elev. 109.62

* NOTE:-
Sheet 14, showing work to be done by the Boston & Maine Railroad is not available at this time but will become part of the construction plans at a later date.

REVISION △ SEPT. 20, 1960
SHEET 14 NOT TO BE ADDED.
FOR PLANS OF R.R. FORCE ACCOUNT WORK SEE SHEETS 6 AND 7 BRIDGE NO. L-15-77

INDEX OF SHEETS

SHEET	TITLE
1	TITLE SHEET
2	BORING DATA
3	BORING DATA
4	GENERAL PLAN
5	FOUNDATION PLAN
6	WESTERLY ABUTMENT
7	EASTERLY ABUTMENT
8	WINGWALLS
9	TRANSVERSE SECTION
10	TYPICAL CONCRETE DETAILS
11	FRAMING PLAN
12	TYPICAL STEEL DETAILS
13	EXPANSION DAM
14 *	PLAN OF RAILROAD FORCE ACCOUNT WORK

EDWARDS AND KELCEY
ENGINEERS AND CONSULTANTS
BOSTON MASS.

May 3, 1961	△ Sheet No. 11 - Weld Size - Revised - Stiffeners - Added
JAN. 12, 1961	△ Sheet No. 4 - Rail Dimensions Revised, Angle @ Ramp E-1 Revised
SEPT. 20, 1960	SHEET 1 - REVISION △ NOTE ABOUT R.R. FORCE ACCOUNT WORK
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

THE COMMONWEALTH OF MASSACHUSETTS
PROPOSED BRIDGE
LOWELL
LOWELL CONNECTOR
OVER BOSTON & MAINE RAIL ROAD

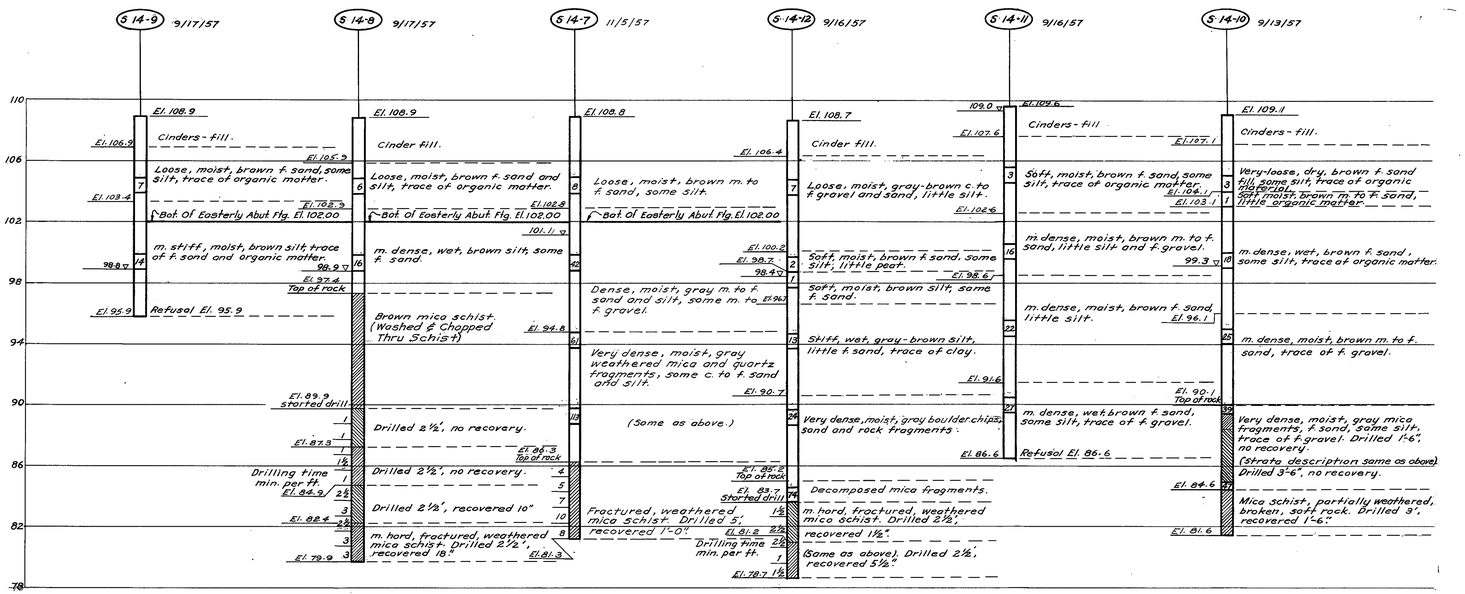
SCALES AS NOTED

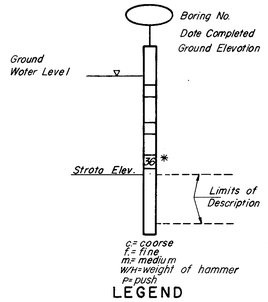
OFFICE OF
DEPARTMENT OF PUBLIC WORKS
100 NASHUA ST. BOSTON, MASS.
JUNE 1960

BRIDGE ENGINEER — CHIEF ENGINEER

PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS	U-358(7)		118	277

Easterly Abutment Foundations To Be On Steel Piles.





BORING NOTES

Location of Borings Shown On Key Plan Thus • S14-1. Borings Taken For Purpose Of Design Only, And Show Conditions At Boring Points Only, But Do Not Necessarily Show Nature Of Materials To Be Encountered During Construction.

*-Indicates Blow Per Ft. On 2" O.D. Split Spoon Produced By 30" Fall Of 140# Hammer.

All Borings Were Made Between September And November 1957 By American Drilling Co., Inc. East Providence, R. I.

Boring Samples May Be Seen At The Department Of Public Works' Laboratory In The Maintenance Building On Rte. 9 In Wellesley.

BORING DATA

Scale: ¼" = 1'-0"

DATE	DESCRIPTION
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

USE ONLY PRINTS OF LATEST DATE

PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
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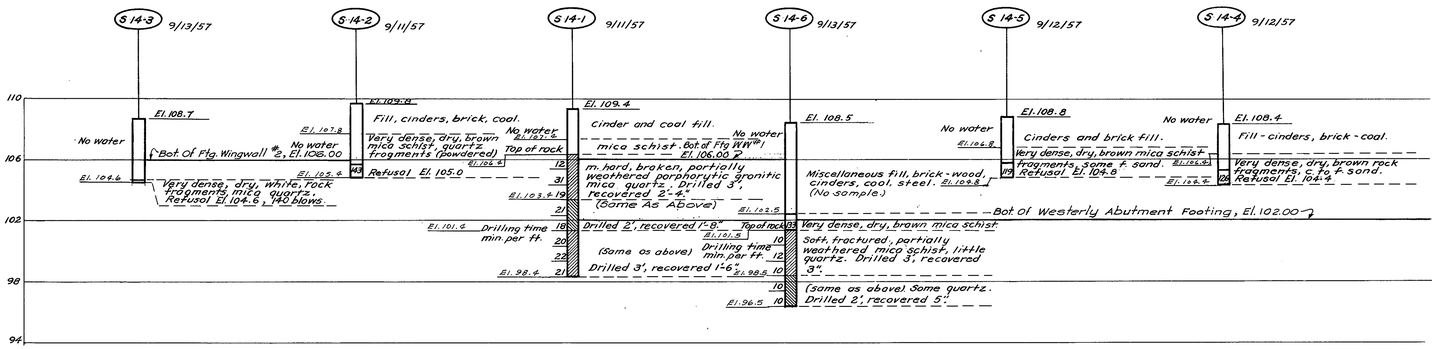
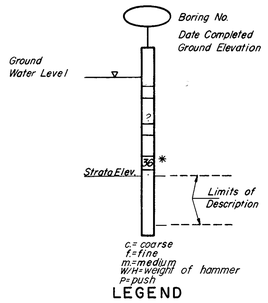


BORING DATA

Scale: 1/4" = 1'-0"



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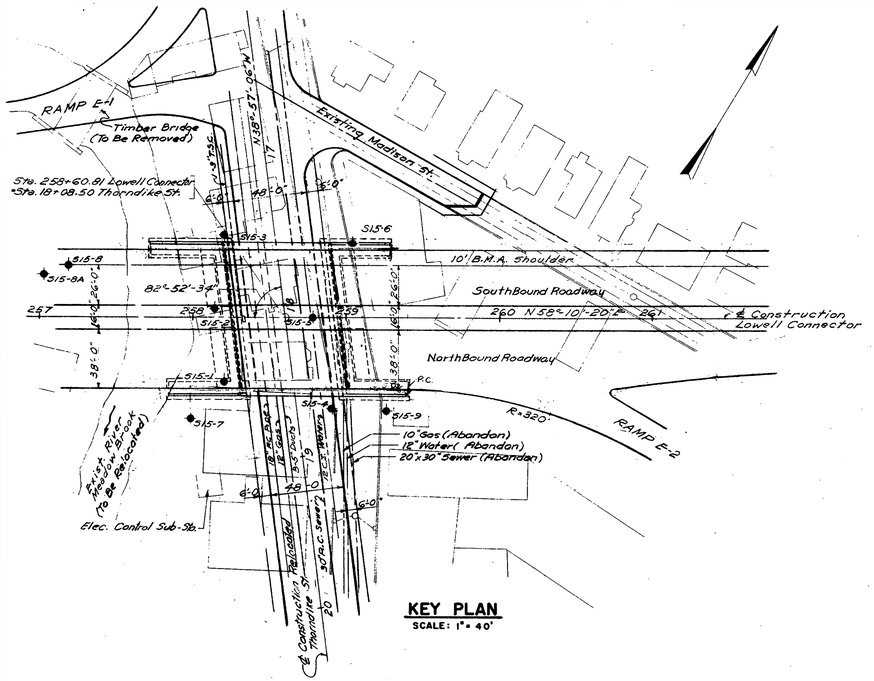
PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.	U-358(7)		131	277

HIGHWAY CKD. BY:
DATE:
STRUCTURE CKD. BY: W
DATE: 2-18-60



KEY PLAN

SCALE: 1" = 40'

ESTIMATED QUANTITIES

(NOT GUARANTEED)

Bridge Structure (L-15-79)	1	Lump Sum
Bridge Excavation	960	C.Y.
Class B Rock Excavation	5	C.Y.
Gravel Borrow	1,880	C.Y.
Class I Bit. Conc. Pavement Type I-1	90	Tons
Steel Piles (10-BP42)	3,170	L.F.
Steel Pile Splices (10-BP42)	4	Each
Class G Cement Concrete Masonry	80	C.Y.
Under Bridge Lighting (L-15-79)	1	Lump Sum

INCLUDED UNDER BRIDGE STRUCTURE (L-15-79)

(Quantities Not Guaranteed)

Steel Reinforcement For Structures	86,000	Lbs.
Structural Steel	188,000	Lbs

GENERAL NOTES

FOUNDATIONS

Foundations May Be Altered, If Necessary, To Suit Conditions Encountered During Construction.

DATE & SEAL

To Be Placed On Inside Faces of Northeasterly And Southwesterly End Posts As Shown In Detail On Sheet 10. A Sheet Showing Size And Character Of Numerals Will Be Furnished. Seal Will Be Furnished By The Commonwealth And Shall Be Placed By The Contractor.

DESIGN

In Accordance With The Current Specifications Of The American Association Of State Highway Officials 1957 For H20-S16-44 Loading (Modified For Military Loading)

REINFORCEMENT

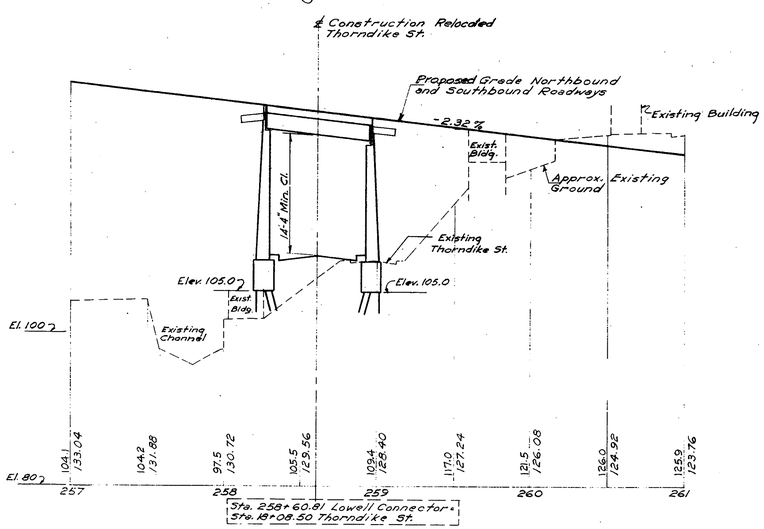
All Bars Shall Have Deformations Conforming To A.S.T.M. Designation A-305. Unless Otherwise Shown On Plans, Reinforcing Bars Shall Be Lapped 20 Diameters To Make A Splice, Except That Main Reinforcing Bars Near The Top Of Slabs And Beams Having More Than 12 Inches Of Concrete Under The Bars Shall Be Lapped 35 Diameters To Make A Splice.

DATUM

Datum El. 0.00 Refers To U.S.C. & G.S. M.S.L. Of 1929

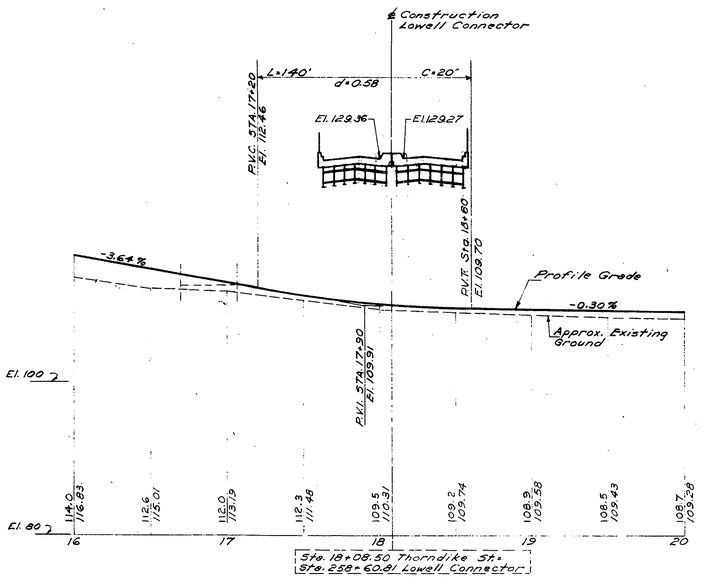
BENCH MARK

Sta. 258+78± Survey Pt. #5 R.R. Spike in Sidewalk South Side Thorndike St. Elev. 109.47



PROFILE – LOWELL CONNECTOR

SCALES: HORIZ. 1" = 40' VERT. 1" = 8'



PROFILE – THORNDIKE ST.

SCALES: HORIZ. 1" = 40' VERT. 1" = 8'

INDEX OF SHEETS

SHEET	TITLE
1	TITLE SHEET
2	BORING DATA
3	BORING DATA
4	GENERAL PLAN & ELEVATION
5	FOUNDATION PLAN
6	WESTERLY ABUTMENT
7	EASTERLY ABUTMENT
8	WINGWALL ELEVATIONS
9	TRANSVERSE SECTION
10	TYPICAL CONCRETE DETAILS
11	FRAMING PLAN
12	TYPICAL STEEL DETAILS

JAN. 12, 1961	△1 Sheet 4 - Rail Exp. Posts Revised
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

THE COMMONWEALTH OF MASSACHUSETTS

PROPOSED BRIDGE

LOWELL

LOWELL CONNECTOR

OVER THORNDIKE STREET

SCALES AS NOTED

OFFICE OF
DEPARTMENT OF PUBLIC WORKS
100 NASHUA ST. BOSTON, MASS.

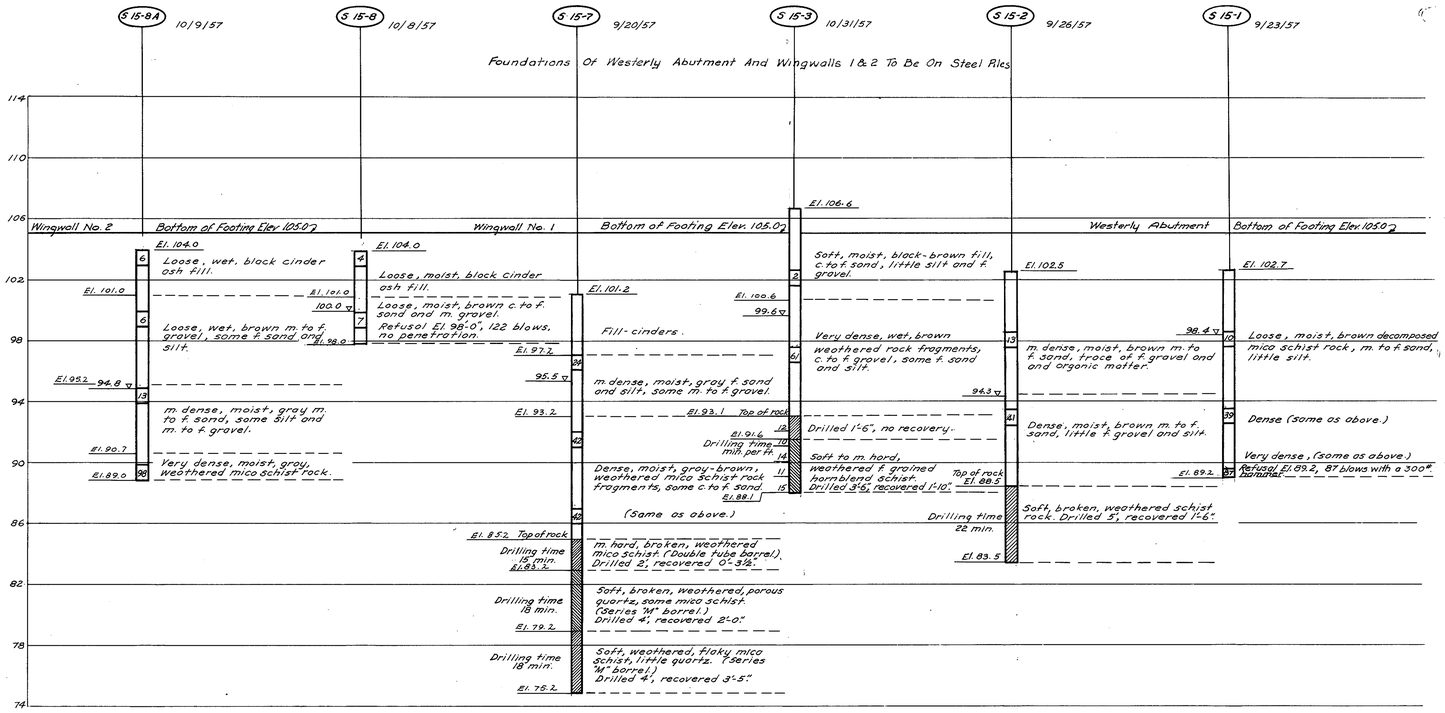
JUNE 1960

A. H. Kane — BRIDGE ENGINEER

E. J. McCarthy — CHIEF ENGINEER

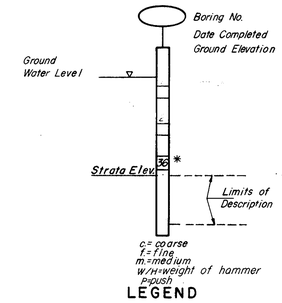
EDWARDS AND KELCEY
ENGINEERS AND CONSULTANTS
BOSTON MASS.

PUB. RD. DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.	U-358(7)		132	277



BORING DATA

Scale: 1/4" = 1'-0"



BORING NOTES

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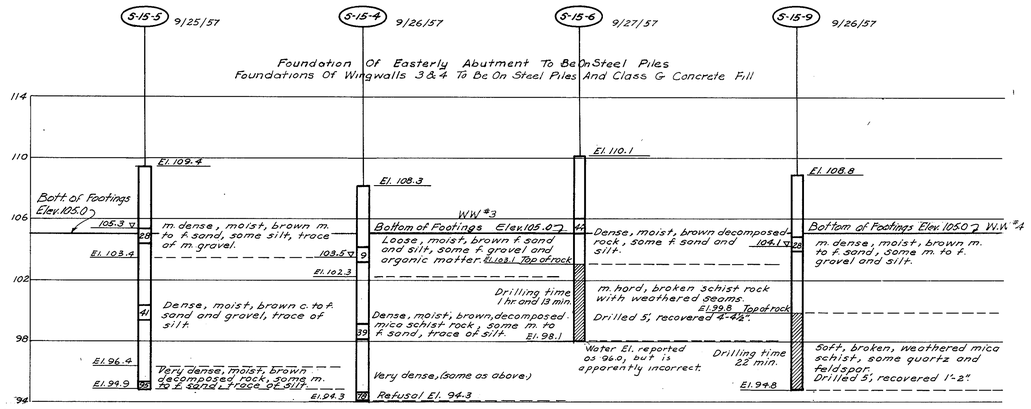
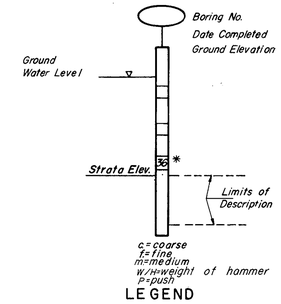


BORING DATA

Scale: 1/4" = 1'-0"



LEGEND

BORING NOTES

Location of Borings Shown On Key Plan Thus ● S15-1. Borings Taken For Purpose Of Design Only, And Show Conditions At Boring Points Only, But Do Not Necessarily Show Nature Of Materials To Be Encountered During Construction.

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Boring Samples May Be Seen At The Department Of Public Works' Laboratory In The Maintenance Building On Rte. 9 In Wellesley.

DATE	DESCRIPTION
JUNE 4, 1960	ISSUED FOR CONSTRUCTION

USE ONLY PRINTS OF LATEST DATE

Appendix D

NOT USED

Appendix E

City of Lowell Ordinance for Excavations and Application for Street Opening and Trench Permits

City of Lowell
Office of the City Manager

City Hall
375 Merrimack street
Lowell, Massachusetts 01852
www.lowellma.gov

Bernard F. Lynch
City Manager

tel. 978-970-4000
fax 978-970-4007

"A"

February 5, 2009

Mayor Edward Caulfield
and
Members of the City Council

RE: Ordinance regarding Excavations and Trenches

Dear Mayor Caulfield and City Councillors:

The Legislature passed a recent law (Mass G. L. Ch. 82A) mandating new safeguards pertaining to excavations and trenches in streets and ways and safety requirements regarding same. As directed by the legislation, the Dept. of Public Safety subsequently passed trench safety regulations supplementing the legislation provisions (520 CMR 14.00 ff).

The purpose of the above-referenced legislation and regulations is to better protect the general public and those working in trenches from injuries related to excavations and trenches.

The enclosed Ordinance has been drafted in order to bring various sections of Chapter 243 of the City Code up to date and into conformity with the new legislation and regulations.

The City Engineer and other involved departments have worked with the Law Department in drafting the enclosed Ordinance amending the City Code. The Fee Ordinance will also be amended to reflect a proposed fee of $50.00 for a trench permit per location.

Since the new regulations are effective March 1, 2009, it is recommended that both Ordinances be referred to a public hearing for February 24, 2009 and timely advertised for such date.

Yours very truly,

Bernard F. Lynch
City Manager

cc: City Solicitor
Asst. City Solicitor
Commissioner of Public Works
City Engineer
Executive Director, Wastewater Utility
Building Commissioner

COMMONWEALTH OF MASSACHUSETTS

CITY OF LOWELL

"A"

In City Council

ORDINANCE

An Ordinance Amending 'The Code of Ordinances City of Lowell, Massachusetts" as amended, by amending various sections of Chapter 243 Article VI, thereof entitled "Excavations."

NOW, THEREFORE; BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LOWELL, as follows:

"The Code for the City of Lowell," hereinafter called the "Code", adopted by the City Council on December 23, 2008, is hereby amended with respect to Chapter 243 thereof, entitled "Streets and Sidewalks," as follows:

ARTICLE VI
Excavations

§243-32. Permit required.
Strike out words "or the City Engineer" and replace with "or his/her designee in writing"

Also add sentence at end of section
"The Commissioner of Public Works in the City of Lowell, or his/her designee in writing, is hereby designated and authorized to issue trench excavation permits pursuant to Mass. Gen. Laws, c. 82A, §2."

§243-34. Application requirements.
Strike out §243-34 and substitute the following:
"Prior to issuance of a permit, all of the following requirements must be rigidly observed:

A. Any application for a permit under this article shall be accompanied by a plan meeting the following specifications:

(1) A plan of the proposed work and installation showing location of the work in reference to existing utilities and structures, such as sanitary sewers, storm sewers and drains, and any locatable utility installations, property and street right-of-way lines, bounds and any other necessary physical features, such as curblines and water and gas gates.

(2) Off set lines or ties from locatable or relocateable points must be shown; for example, bound points and property lines.

(3) Cross sections and details of proposed conduits, structures, etc., must be shown.

(4) Construction standards as hereinafter detailed must be visually detailed or inscribed on the plan.

(5) Details of outsized structures, including manholes or vaults, must be shown.

(6) Plans must be stamped and signed by a registered land surveyor or a registered professional engineer. This requirement may be waived by the City Engineer for less complex projects.

(7) Plan sizes shall be a minimum of 8 ½ inches by 11 inches and a maximum of 24 inches by 36 inches.

(8) Each plan shall have three-quarter-inch borders.

(9) The minimum letter size on plans presented for review shall be 1/8 inch.

(10) Each plan presented for review shall include a graphic scale."

§243-41. Wooden sheeting.
Strike out in its entirety and substitute with the following:

"§243-41. Trench Stabilization.
Trench walls shall be stabilized using trench boxes or sheeting, to meet OSHA standards. This stabilization shall not exempt the trench from 520 CMR 14.00 Excavation & Trench Safety Regulations."

§243-45. Work hours.
In subsection A. strike out words up to 4:30 pm "All work...4:30 pm;" and substitute with the following:
"All work to be performed under this article shall be performed between the hours of 7:00 a.m. and 8:00 p.m.;"

§243-47. Notification of commencement of work.
Strike out 1st sentence in its entirety and substitute with the following:
"Written notice of 48 hours given to the Commissioner of Public Works commencing construction is required with verification of receipt of such notice."

§243-48. Amount of trench openable.
Strike out §243-48 and substitute with the following:
"The excavation is to be kept as neat as existing conditions permit, and not more than 150 feet of attended trench shall be left open at any time during working hours. Unattended trenches, as defined in 520 CMR 14.04, shall be covered or barricaded in accordance with said regulations."

§243-49. Barricades, lights and other safety precautions.
Strike out subsection A. and substitute with the following:
"A. To protect the general public, unattended trenches, as defined in 520 CMR 14.04, shall be covered or barricaded in accordance with said regulations."

§243-57. Compaction of trench.
Strike out §243-57 and substitute with the following:
"The trench shall be mechanically or hand-tamped in six-inch lifts, a minimum of two (2) feet above the utility installation, and the remainder of the fill mechanically tamped in lift depths as directed. Copy of compaction test results to be filed with the City Engineer's Office."

§243-58. Quality of backfill material.
Strike out §243-58 and substitute with the following:
"Control density fill (flow fill) is to be used as backfill material in all Right of Ways (ROW). City Engineer's office may waive this if satisfactory compaction test results are provided."

All provisions of the Code of the City of Lowell, as amended, which are consistent with this Ordinance shall continue in effect, but all provisions of said Code inconsistent herewith, are repealed.

It is intended that this Ordinance is divisible and, if any enumerated Section of this Ordinance to add to or amend the Code, is stricken from this Ordinance, then the Code as it read prior to this Ordinance shall remain in full force and effect.

This Ordinance shall take effect immediately upon its passage in accordance with the provisions of Chapter 43 and Chapter 44 of Massachusetts General Laws.

APPROVED AS TO FORM:

David J. Fenton
Assistant City Solicitor

Ordin/trenchamend

Section 14.02 Definitions

Competent Person- A person or persons who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to people, and who has authorization to take prompt corrective measures to eliminate them. A competent person must be able to demonstrate that he or she has been trained in and is knowledgeable about: soil analysis, the use of protections for the General Public and the requirements of this regulation.

Emergency- An unforeseen condition in which the safety of the public is in imminent danger because of a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

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 or public agency which performs excavation operations including the excavation of trenches.

General Public –All natural persons not engaged in the creation of a trench.

Permit Holder –The excavator who is responsible for acquiring a permit from the Permitting Authority.

Permitting Authority – A city, town, or public agency required to administer the provisions of 520 C.M.R. 14.03.

Public Agency — A department, agency, board, commission, authority, or other instrumentality of the Commonwealth or political subdivision of the Commonwealth or two or more subdivisions thereof.

Serious Injury - A personal injury that results in death, dismemberment, significant disfigurement, permanent loss of the use of a body organ, member, function, or system, a compound fracture, or other significant injury that requires immediate admission and overnight hospitalization and observation by a licensed physician.

Trench – An excavation which is narrow in relation to its length, made below the surface ground in excess of 3 feet below grade and the depth of which is, in general, greater than the width, but the width of the trench, as measured at the bottom, is no greater than 15 feet.

Unattended Trench – A trench where neither the permit holder, excavator, nor any of the people who work in or at the trench are present.

Application for Street Opening and Trench Permits

City of Lowell

Massachusetts
Office of the Commissioner of Public Works

All Fields below are REQUIRED

	Property Owner(if applicable)	**Contractor(Excavator)-Applicant**
Name		
Address		
DIG SAFE		Phone/cell Number:
Bonds Expiration Date:		Hoisting License Number/Grade:
Insurance Co. & Exp Date:		Name/Expiration:
Start Date:		Operator Name: (all)
End Date:	(no more than 60 days)	Site Supervisor/Competent Person:

Applying for the following Permit(s):

Street Opening ☐ Trench ☐ Street Closing ☐

See City Ordinance Art. VI, Sec. 243 p31-65 See 520 CMR 14.00

Type of Work and Fee

Water
- Water on or off ☐ *
- Final Meter Reading ☐ *
- Opening Hydrant ☐ *
- Hydrant Flow Test ☐ *
- Water Mark Out ☐ *
- Entry fee per unit ☐ *
- Irrigation Meter ☐ *
- New Service > 1” ☐
- Fire Service/Sprinkler ☐

Curb Cuts
- Driveway ☐
- Sidewalk Modification ☐
- Other ☐

Sewer
- New Sewer Service ☐
- Sewer Extension (ft) ☐
- Grinder Pump ☐
- Force Main (ft) ☐
- Sewer Manhole ☐
- Repair Sewer Service ☐

Drainage
- Catch Basin ☐
- Drain Extension (ft) ☐
- Drain Manhole ☐

Miscellaneous
- Dumpster ☐
- Crane ☐
- Other ☐

Utilities (Cable/Electric/Telephone)
- New service ☐
- Manhole Type ( ) ☐
- Repair Service ☐
- Duct Bank ☐

Gas
- New Service ☐
- New Mainline ☐
- Corrosion Control ☐
- Repair Grade( ) ☐
- Other ☐

TOTAL DUE ☐

* To apply for these items, go directly to DPW, 1365 Middlesex St.

Information to be attached to application:

Additional information required (per Lowell City Sec. 243-34) with every application. Applicant is responsible for supplying all necessary documentation. Permit will not be issued without this supplemental information. A set of plans, or a sketch (drawn to scale), are required under the new trench regulations.

Application for Street Opening and Trench Permits

City of Lowell

Massachusetts
Office of the Commissioner of Public Works

Traffic Requirements

Police Details	Contractor to make arrangements
Work Hours	M-F 7:00AM to 5:00PM Per City Ordinance 243-45 Work Hours. Prior DPW permission required for work outside these hours.
Signs Required	Yes No
Other	

Inspections Required 24 hour notice required
Yes _____
No _____

Notification of Commencement of Work 48 hours per City Ordinance 243-47

Inspector's Notes:

Flow fill receipt: or compaction test results

Owner, and Contractor (Excavator)/Applicant request that we may be permitted under the terms and conditions of Lowell City Code relating to openings and excavations in streets (Sections 243.31 through 243.65) to do the above work and we, jointly and severally, agree to fully indemnify the City of Lowell against all claims for damages for injuries to persons or property, and against all cost, expenses, and losses occasioned by, or arising from such occupancy and the use of said street or streets, and we, jointly and severally, further agree to pay all cost, and damages which may be recovered against the City of Lowell, by reason of, or on account of our occupancy of said property. We, jointly and severally, further agree to restore and maintain for a period of five (5) years said street opening to City standards and specifications. We, jointly and severally, further certify that we are familiar with and shall comply with 520 CMR 14.00 and 29 CFR 1926.620 (OSHA) and applicable City Code provisions. Applicant(s) acknowledge receipt of completed Application, with attached copies of summaries of applicable regulation requirements.

THIS APPLICATION DOES NOT CONSTITUTE A STREET OPENING/TRENCH PERMIT

Signature of Contractor (Excavator)/Applicant

Signature of Owner (if applicable)

Approvals Required

City Engineer (first signature)

Date of Application:

Water Utility

Wastewater Utility

Traffic Control Officer

Fire Chief

Building Commissioner

DPW Commissioner (last signature)

Appendix F

Lowell Conservation Commission — Order of Conditions for Marginal Sewer Relief Pipe

The City of Lowell • Dept. of Planning and Development • Division of Development Services
Lowell City Hall • 375 Merrimack Street • Lowell, MA 01852
P: 978.674.4144 • F: 978.446.7103
www.LowellMA.gov

Diane N. Tradd
Assistant City Manager/Director

R. Eric Slagle
Director of Development Services

Shaun Shanahan
Building Commissioner

SHANNON GOUVEIA
Notary Public
Commonwealth of Massachusetts
My Commission Expires
December 16, 2016

A TRUE COPY
ATTEST:
SHANNON GOUVEIA
NOTARY PUBLIC
LOWELL, MASS
MY COMMISSION EXPIRES 12/16/2016

To: Mark Young

From: Swaathi Joseph, Assistant Planner/Conservation Agent

Date: April 10, 2015

Subject: Order of Conditions – Approval

Important: The Order of Conditions is a legal document! Please read the Order of Conditions carefully. Contact the Conservation Office if you have any questions.

The following must be done prior to the start of work:

1. Orders of Conditions must be recorded with the Middlesex North Registry of Deeds. Proof of recording must be returned to our office **before work can begin** on the site. Failure to record this Order within twenty-eight (28) days from the date of issuance will result in the Order becoming Null and Void.
2. A DEP sign with the appropriate file number shall be displayed at the site.
3. The Conservation Commission **must** be notified **48 hours** prior to construction to allow for inspection of siltation control devices.
4. Review your Order for any additional conditions before any work commences.

Please be aware that there is a **10-day appeal period** from the date on the Order of Conditions. If you start work during this time, you are working at your own risk.

Any change to the approved plans requires the applicant to contact the Conservation Commission in writing to determine whether the change is significant enough to require a new public hearing.

You have 3 years to complete the approved work.

Once work is complete, you shall submit a "**Request for Certificate of Compliance**" to the Conservation Commission to properly close out your file.

2016 00009729
Bk: 29860 Pg: 180 Page: 1 of 17
Recorded: 03/09/2016 10:52 AM

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
206-0741
MassDEP File #

eDEP Transaction #

Lowell
City/Town

A. General Information

Please note: this form has been modified with added space to accommodate the Registry of Deeds Requirements

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

1. From: Lowell
Conservation Commission

2. This issuance is for (check one): a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

Mark — a. First Name
Young — b. Last Name
Lowell Regional Wastewater Utility — c. Organization
451 First Street Blvd — d. Mailing Address
Lowell — e. City/Town
MA — f. State
01850 — g. Zip Code

4. Property Owner (if different from applicant):

a. First Name
b. Last Name
City of Lowell — c. Organization
375 Merrimack Street — d. Mailing Address
Lowell — e. City/Town
MA — f. State
01852 — g. Zip Code

5. Project Location:

849 Pawtucket Street — a. Street Address
Lowell — b. City/Town
0071 4550 0849 0000 — c. Assessors Map/Plat Number
d. Parcel/Lot Number

Latitude and Longitude, if known: 42d38m26s — d. Latitude; -71d20m20s — e. Longitude

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Middlesex
a. County

b. Certificate Number (if registered land)

2210
c. Book

31
d. Page

7. Dates: 3/18/2015 a. Date Notice of Intent Filed; 4/8/2015 b. Date Public Hearing Closed; 4/10/2015 c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

See attached "Additional Plans & Documents - DEP# 206-0741
a. Plan Title

b. Prepared By

c. Signed and Stamped by

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

a. ☐ Public Water Supply
b. ☐ Land Containing Shellfish
c. ☒ Prevention of Pollution
d. ☐ Private Water Supply
e. ☐ Fisheries
f. ☒ Protection of Wildlife Habitat
g. ☐ Groundwater Supply
h. ☒ Storm Damage Prevention
i. ☐ Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

a. ☒ the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

B. Findings (cont.)

Denied because:

b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. ☐ Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) _____ a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☐ Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. ☐ Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. ☐ Land Under Waterbodies and Waterways	a. square feet	b. square feet	c. square feet	d. square feet
	e. c/y dredged	f. c/y dredged		
7. ☐ Bordering Land Subject to Flooding	a. square feet	b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8. ☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. ☐ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
14. ☐ Coastal Dunes	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
15. ☐ Coastal Banks	a. linear feet	b. linear feet		
16. ☐ Rocky Intertidal Shores	a. square feet	b. square feet		
17. ☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. ☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. ☐ Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. ☐ Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		

B. Findings (cont.)

* #22. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

22. ☐ Restoration/Enhancement *:

a. square feet of BVW | b. square feet of salt marsh

23. ☐ Stream Crossing(s):

a. number of new stream crossings | b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. The work is a maintenance dredging project as provided for in the Act; or
   b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
   c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on 4/10/2018 unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.

9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

    "Massachusetts Department of Environmental Protection" [or, "MassDEP"]

    "File Number 206-0741 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.

12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.

13. The work shall conform to the plans and special conditions referenced in this order.

14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.

15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
    (1) ☒ is subject to the Massachusetts Stormwater Standards
    (2) ☐ is NOT subject to the Massachusetts Stormwater Standards

    If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

    a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

    b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
    i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
    ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
    iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.

k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.

l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):
See attached "Standard Lowell Order of Conditions"

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☒ Yes ☐ No

2. The Lowell Conservation Commission hereby finds (check one that applies):

   a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

   1. Municipal Ordinance or Bylaw _____ 2. Citation _____

   Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

   b. ☒ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

   1. Municipal Ordinance or Bylaw: City of Lowell Wetlands Ordinance — Ch. 280, S. 1-13

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.
   The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):
   See attached "Standard Lowell Order of Conditions"

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

1. Date of Issuance

Please indicate the number of members who will sign this form.
This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signatures:

Kathy Bird

William Lady

Louisa Varnum

☐ by hand delivery on

Date

☒ by certified mail, return receipt requested, on 4/10/2015

Date

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

_____
Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

_____
Conservation Commission

Please be advised that the Order of Conditions for the Project at:

_____ _____
Project Location MassDEP File Number

Has been recorded at the Registry of Deeds of:

_____ _____ _____
County Book Page

for: _____
Property Owner

and has been noted in the chain of title of the affected property in:

_____ _____
Book Page

In accordance with the Order of Conditions issued on:

_____
Date

If recorded land, the instrument number identifying this transaction is:

_____
Instrument Number

If registered land, the document number identifying this transaction is:

_____
Document Number

_____
Signature of Applicant

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

Provided by DEP

A. Request Information

1. Location of Project

a. Street Address | b. City/Town, Zip

c. Check number | d. Fee amount

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town | State | Zip Code

Phone Number | Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town | State | Zip Code

Phone Number | Fax Number (if applicable)

4. DEP File Number:

B. Instructions

1. When the Departmental action request is for (check one):

- ☐ Superseding Order of Conditions – Fee: $120.00 (single family house projects) or $245 (all other projects)
- ☐ Superseding Determination of Applicability – Fee: $120
- ☐ Superseding Order of Resource Area Delineation – Fee: $120

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts,* to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see http://www.mass.gov/eea/agencies/massdep/about/contacts/).

4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

STANDARD LOWELL ORDER OF CONDITIONS

1. Forty-eight (48) hours prior to the commencement of any work, the Lowell Conservation Commission will be given written notification of said work.

2. No Work shall commence until this Order of Conditions has been recorded at the Registry of Deeds, Middlesex North and the recording information has been submitted to the Lowell Conservation Commission office.

3. Failures to record this Order of Conditions within twenty-eight (28) days from the date of issuance will result in the Order becoming Null and Void.

4. Additional erosion/sedimentation control measures shall be installed as deemed necessary at the direction of the Lowell Conservation Commission and/or the agent (s).

5. The Lowell Conservation Commission reserves the right to impose additional conditions in order to protect the public interests as identified in M.G.L. 131, s40.

6. Any changes made or intended to be made in the plans submitted to the Lowell Conservation Commission shall require the applicant to inquire of this department in writing as to whether the change is significant enough to require the filing of a new Notice of Intent.

7. The Lowell Conservation Commission and/or the authorized representative(s) reserve the right to access the property at any time for the purpose of inspecting the work covered by this Order of Conditions.

8. This Order of Conditions shall be made a part of all construction specifications and contracts.

9. The Order of Conditions shall apply to any successor in control or successor in interest of the property described in the Notice of Intent and accompanying plans submitted to the Lowell Conservation Commission.

10. Unless otherwise specifically stated in this Order, this Order shall also be a permit under the City of Lowell Wetlands Ordinance, City of Lowell Code of Ordinances Section 31 - 54.1 et.seq. and all conditions of this Order shall also be conditions of such permit.

11. No plants shall be used that are listed as invasive or potentially invasive on the Massachusetts Invasive Plant Advisory Group (MIPAG) list of invasive plants. A list of plantings shall be submitted to the Conservation commission for approval.

12. Upon completion of the project, the applicant shall submit with their request for a Certificate of Compliance, a statement and as-built plans by a registered professional engineer, architect, landscape architect or land surveyor stating that the project has been built in accordance with this Order of Conditions and referenced site plans.

If you have any question regarding this Order of Conditions, Please contact the Lowell Conservation Commission office at (978) 446-7200

ADDITIONAL PLANS & DOCUMENTS – DEP# 206-0741

Applicant: Mark Young
Lowell Regional Wastewater Utility
451 First Street Blvd
Lowell, MA 01850
Project Location: 849 Pawtucket Street, Lowell, MA

Plan or Document Title	Created By	Signed and Stamped By	Final Revision Date	Scale	Notes
Marginal Relief Pipe	CDM Smith	James Drake	March 2015	varies	Total: 3
Miscellaneous Details I	"		March 2015	nts	
Miscellaneous Details II	"		March 2015	nts	
Miscellaneous Details III	"		March 2015	nts	

Appendix G

Lowell Regional Water Utility – Contractor Protocol for CSO Projects

To: T.J. McCarthy, Assistant City Manager
Mark Young, Executive Director Waste Water Utility
Archie Trainor, Superintendent of Distribution

From: Daniel J. Lahiff, Executive Director

Date: November 12,2009

Re: Contractor Protocol CSO projects.

In order to avoid any future issues regarding consumer complaints in relations to work being performed by private contractors, the following procedures are to be taken as related to each specific incident involving the water utility.

Temporary Water Services: A plan and approved schedule submittal is required before beginning any work which may disrupt the water system. No interruptions in consumer water services or fire protection are permitted.

Planned Shut Downs: All planned shut downs of water mains or water services must be approved by the LRWU and require public notification (flyers) to all residents potentially affected.

Emergency Shut Downs: In the event of an emergency shut down during regularly scheduled work hours (M-F 8am -4pm) Supt. Archie Trainor of the LRWU is to be notified immediately. Should Mr. Trainor not be available, Executive Director, Daniel Lahiff must be notified. All residents affected must also be notified through public notification (flyers). All incidents that occur after the regularly scheduled work hours or weekends, require the contractor to contact the LRWU and request to speak with the Head Filter Operator on duty.

Consumer Complaints: The contractor is required to contact the LRWU in the event of any consumer complaint related to work being performed. This includes but not limited to, low pressure, rusty water, no water, meter problems, leaks and other concerns of the residents. The contractor must follow the notification process as directed in an Emergency situation. Also, any actions taken during this time must be conveyed to the LRWU.

Use of Hydrants: Any intended use of City of Lowell fire hydrant must be approved by the LRWU.

Operation of City Water Gates: Any operation of City of Lowell water gates must be approved by the LRWU.

Contact Numbers:	LRWU	978-970-4242
	Archie Trainor	978-423-5332
	Daniel Lahiff	978-374-1761

Appendix H

City of Lowell Certificate of Compliance Form for Public Construction more than $10,000

CERTIFICATION OF COMPLIANCE
G.L.c.30, §39S
PUBLIC CONSTRUCTION MORE THAN $10,000.00

I certify under the pains and penalties of perjury that:

1. the Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

2. all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration ("OSHA") that is at least 10 hours in duration and 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

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 OSHA that is at least 10 hours in duration.

_____	_____
Signature of Individual or Corporate Name (Mandatory)	By: Corporate Officer (Mandatory, if applicable)

Approval of a contact or other agreement will not be granted unless this certification clause is signed by the applicant.

Appendix I

MBTA License Agreement - April 2016

Appendix J

Pan Am Railways Specifications

SECTION 5.3 SPECIFICATIONS FOR PIPELINES CONVEYING NONFLAMMABLE SUBSTANCES

5.3.1 SCOPE (1993)

Pipelines included under these specifications are those installed to carry steam, water or any nonflammable substance except nonflammable gas products as covered in Section 5.2, Specifications for Uncased Gas Pipelines within the Railway Right-of-Way which, from its nature or pressure, might cause damage if escaping on or in the vicinity of railway property. The term "engineer" as used herein means chief engineer of the railway company, or his authorized representative.

5.3.2 GENERAL REQUIREMENTS (1993)

a. Pipelines under railway tracks and across railway rights-of-way shall be encased in a larger pipe or conduit called the casing pipe as indicated in Figure 5-3. Casing pipe may be omitted under the following conditions:

   (1) Under secondary or industry tracks as approved by the engineer.

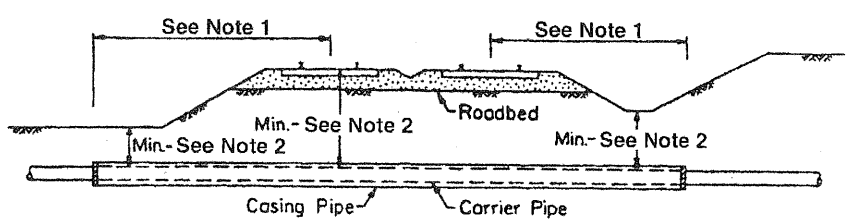
   (2) On pipelines in streets where joints are of leakproof construction and the pipe material will safely withstand the combination of internal pressure and external loads.

   (3) For non-pressure sewer crossings where the pipe strength is capable of withstanding railway loading.

b. Pipelines shall be installed under tracks by boring or jacking, if practicable.

c. Pipelines shall be located, where practicable, to cross tracks at approximately right angles thereto but preferably at not less than 45 degrees and shall not be placed within culverts nor under railway bridges where there is likelihood of restricting the area required for the purposes for which the bridges or culverts were built, or of endangering the foundations.

d. Pipelines laid longitudinally on railway rights-of-way shall be located as far as practicable from any tracks or other important structures. If located within 25 feet of the centerline of any track or where there is danger of damage from leakage to any bridge, building or other important structure, the carrier pipe shall be encased or of special design as approved by the engineer.



Note 1: See Article 5.3.4.3
Note 2: See Article 5.3.5.2

Figure 5-3. Casing Pipe Installation

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e. Any replacement of a carrier pipe shall be considered a new installation, subject to the requirements of these specifications.

f. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, then the higher degree of protection so prescribed shall supersede the applicable portions.

g. Pipelines and casing pipe shall be suitably insulated from underground conduits carrying electric wires on railway rights-of-way.

5.3.3 CARRIER PIPE (1993)

a. Carrier line pipe and joints shall be of acceptable material and construction as approved by the engineer. Joints for carrier line pipe operating under pressure shall be mechanical or welded type.

b. The pipe shall be laid with sufficient slack so that it is not in tension.

5.3.4 CASING PIPE (1993)

a. Casing pipe and joints shall be leakproof construction, capable of withstanding railroad loading. The inside diameter of the casing pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and over in diameter. It shall, in all cases, be great enough to allow the carrier pipe to be removed subsequently without disturbing the casing pipe or roadbed.

b. When casing is installed without benefit of a protective coating or said casing is not cathodically protected, the wall thickness shown above shall be increased to the nearest standard size which is a minimum of 0.063 inch greater than the thickness required except for diameters under 12¾ inches (Table 5-5).

5.3.4.1 Steel Pipe

Steel pipe shall have a specified minimum yield strength, SMYS, of at least 35,000 psi.

5.3.4.2 Concrete and Corrugated Metal Pipe

For pressures under 100 psi in the carrier pipe, the casing pipe may be reinforced concrete pipe conforming to AREMA specifications in Chapter 8, Concrete Structures and Foundations, Part 10, Reinforced Concrete Culvert Pipe or coated corrugated metal pipe conforming to the AREMA specifications for such pipe, Part 4, Culverts this Chapter.

5.3.4.3 Length of Pipe

Casing pipe under tracks and across railway rights-of-way shall extend to the greater of the following distances, measured at right angles to centerline of track. If additional tracks are constructed in the future or the railway determines that the roadbed should be widened, the casing shall be extended or other special design incorporated.

- 2 feet beyond toe of slope.
- 3 feet beyond ditch.
- A minimum distance of 25 feet from center of outside track when end of casing is below ground.

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Table 5-5. Minimum Wall Thickness for Steel Casing Pipe for E80 Loading

Nominal Diameter (inches)	When coated or cathodically protected Nominal Thickness (inches)	When not coated or cathodically protected Nominal Thickness (inches)
12¾ and under	0.188	0.188
14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 and 22	0.281	0.344
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 and 36	0.469	0.531
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 and 46	0.594	0.656
48	0.625	0.688
50	0.656	0.719
52	0.688	0.750
54	0.719	0.781
56 and 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 and 68	0.875	0.938
70	0.906	0.969
72	0.938	1.000

5.3.5 CONSTRUCTION (1993)

a. Casing pipe shall be so constructed as to prevent leakage of any substance from the casing throughout its length except at ends. Casing shall be so installed as to prevent the formation of a waterway under the railway, with an even bearing throughout its length, and shall slope to one end (except for longitudinal occupancy).

b. Where casing and/or carrier pipe is cathodically protected, the engineer shall be notified and suitable test made to ensure that other railway structures and facilities are adequately protected from the cathodic current in accordance with the recommendations of current Reports of Correlating Committee on Cathodic Protection, published by the National Association of Corrosion Engineers.

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5.3.5.1 Method of Installation

- Installations by open-trench methods shall comply with Part 4, Culverts, Section 4.12, Assembly and Installation of Pipe Culverts.

- Bored or jacked installations shall have a bored hole diameter essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (including coating) by more than approximately 1 inch, remedial measures as approved by the chief engineer of the railway company shall be taken. Boring operations shall not be stopped if such stoppage would be detrimental to the railway.

- Tunneling operations shall be conducted as approved by the engineer. If voids are caused by the tunneling operations, they shall be filled by pressure grouting or by other approved methods which will provide proper support.

5.3.5.2 Depth of Installation

5.3.5.2.1 Casing Pipe

Casing pipe under railway tracks and across railway rights-of-way shall be not less than 5½ feet from base of railway rail to top of casing at its closest point, except that under secondary or industry tracks this distance may be 4½ feet. On other portions of rights-of-way where casing is not directly beneath any track, the depth from ground surface or from bottom of ditches to top of casing shall not be less than 3 feet.

5.3.5.2.2 Carrier Pipe

Carrier pipe installed under secondary or industry tracks without benefit of casing shall be not less than 4½ feet from base of railway rail to top of pipe at its closest point nor less than 3 feet from ground surface or from bottom of ditches.

5.3.5.3 Shut-Off Valves

Accessible emergency shut-off valves shall be installed within effective distances each side of the railway as mutually agreed to by the engineer and the pipeline company. These valves should be marked with signs for identification. Where pipelines are provided with automatic control stations at locations and within distances approved by the engineer, no additional valves shall be required.

5.3.5.4 Longitudinal Pipelines

Pipeline laid longitudinally on railway rights-of-way 50 feet or less from center line of track, shall be buried not less than 4 feet from ground surface to top of pipe. Where pipeline is laid more than 50 feet from center line of track, minimum cover shall be at least 3 feet.

5.3.6 APPROVAL OF PLANS (1993)

a. Plans for proposed installation shall be submitted to and meet the approval of the engineer before construction is begun.

b. Plans shall be drawn to scale showing the relation of the proposed pipeline to railway tracks, angle of crossing, location of valves, railway survey station, right-of-way lines and general layout of tracks and railway facilities. Plans should also show a cross section (or sections) from field survey, showing pipe in

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relation to actual profile of ground and tracks. If open-cutting or tunneling is necessary, details of sheeting and method of supporting tracks or driving tunnel shall be shown.

c. In addition to the above, plans should contain the data found in Table 5-6.

Table 5-6. Plan Data

Description	Carrier Pipe	Casing Pipe
Contents to be handled		
Outside Diameter		
Pipe Material		
Specification and grade		
Wall thickness		
Actual Working pressure		
Type of joint		
Coating		
Method of installation		
Seals: Both ends: One end: Type:		
Bury: Base of rail to top of casingftin.		
Bury: (Not beneath tracks)ftin.		
Bury: (Roadway ditches)ftin.		
Type, size and spacing of insulators or supports		
Distance C.L. track to face of jacking/receiving pitsftin.		
Bury: Base of rail to bottom jacking/receiving pitsftin.		
Cathodic protection: Yes ☐ No ☐		

5.3.7 EXECUTION OF WORK (1993)

The execution of the work on railway rights-of-way, including the supporting of tracks, shall be subject to the inspection and direction of the engineer.

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SECTION 5.4 SPECIFICATIONS FOR OVERHEAD PIPELINES CROSSINGS

5.4.1 SCOPE

This section shall govern the design of pipelines which cross the tracks or right-of-way of a Railway Company on overhead structures. It shall include pipelines attached to existing or new vehicle or pedestrian bridges, and existing or new bridges designed for the exclusive use of pipeline facilities. It shall apply to pipelines designed for all levels of operating pressures, to include vacuums, and to all commodities, flammable and non-flammable, usually transported through pipelines.

5.4.2 GENERAL CONDITIONS

5.4.2.1 Location Investigation

Where possible, pipelines shall be installed underground. There may be circumstances that warrant consideration of an overhead pipeline crossing; however, an overhead crossing of the tracks or right-of-way of a Railway by a pipeline facility will be investigated for permitting only in the case where the applicant can demonstrate it has exercised due diligence in locating a subgrade crossing.

5.4.2.2 Use of Existing Structures

In no case shall a bridge or overhead structure owned or maintained by a Railway be used for the attachment of a pipeline facility. Applications proposing to make an attachment to an overhead structure owned and maintained by a party other than a Railway shall submit evidence that the owner of the structure has reviewed the plan and has issued, or proposes to issue, a permit or license for the facility.

5.4.3 GENERAL DESIGN REQUIREMENTS

5.4.3.1 Leak Protection

The design shall provide for protection of the property and track structure of a Railway in the event of a pipeline leak or failure by use of a casing pipe or other means acceptable to the Railway. The design shall direct leaking liquid and dense gaseous products off the Railway right of way, but in no case, less than 25 feet beyond the back of parallel roadway ditches.

5.4.3.2 Emergency Shut-Off Valves

Accessible emergency shut-off valves shall be installed within an effective distance on each side of the Railway right of way. The Engineer may, at his option, accept existing automatic control stations as suitable emergency shut-off valves.

5.4.3.3 Other

Emergency telephone numbers shall be clearly posted on both ends of an overhead pipeline crossing, and pipelines and pipeline bridge structures must have effective apparatus to prevent unauthorized access.

Additional pipeline attachments to an existing overhead pipeline crossing shall be approved by the Railway.

Overhead pipelines could be subjected to high temperatures from the exhaust stacks of stationary running locomotives positioned directly under the carrier pipe. Pipeline contents and the pipeline materials may be adversely affected. The design shall incorporate suitable insulation or other heat deflection measures to prevent damages and insure pipeline integrity under high temperature conditions.

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BOSTON & MAINE CORPORATION
MAINE CENTRAL RAILROAD COMPANY
SPRINGFIELD TERMINAL RAILWAY COMPANY

IRON HORSE PARK
NO. BILLERICA, MASS. 01862

Date:_____

Dear Sirs:

Attached is a package of basic requirements for work affecting Railroad property or operations.

I. General Information - January 1995.

II. Railroad Policies - January 1995.

III. Standard Railroad Specifications - January 1995.

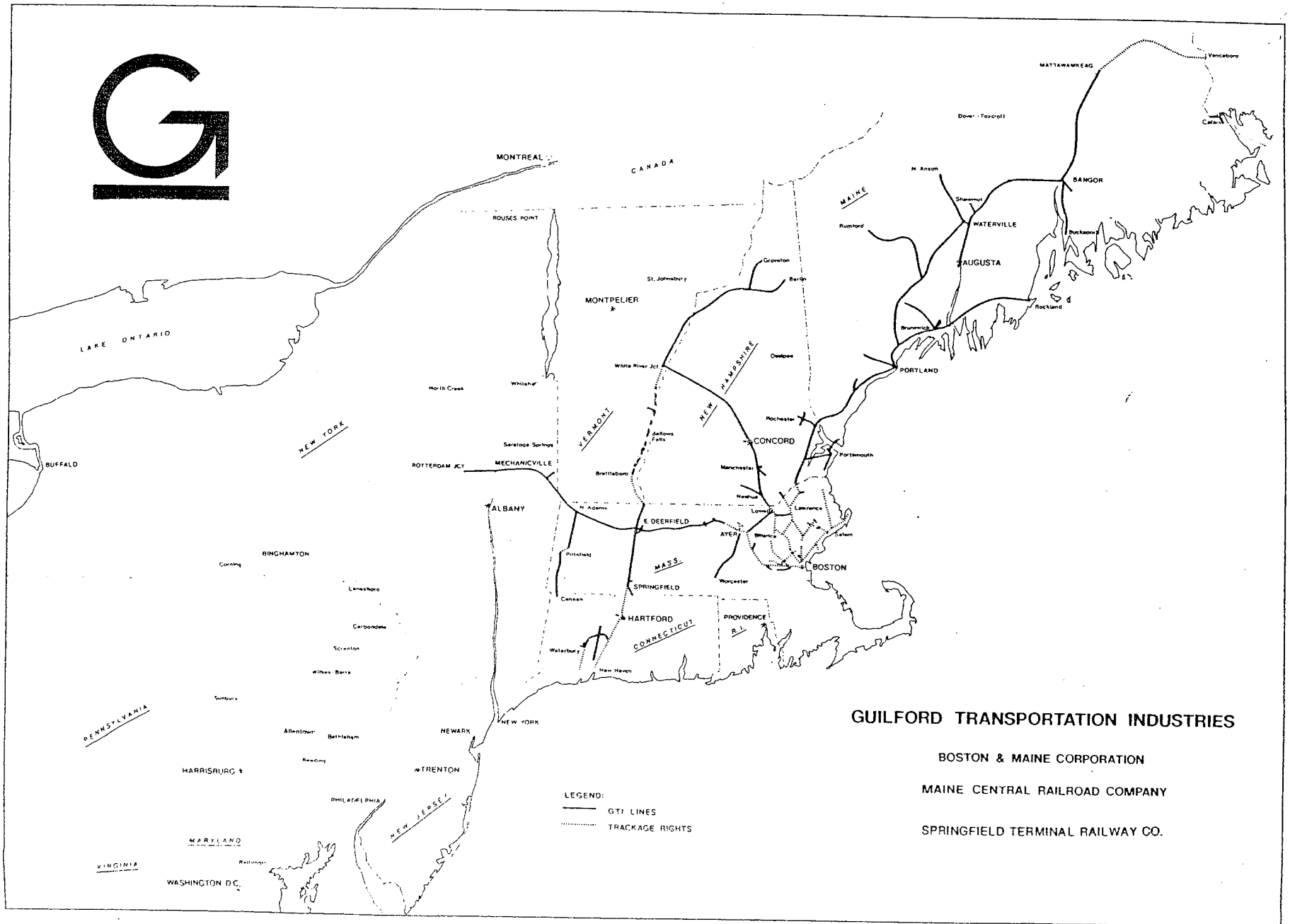
IV. Standard Railroad Service Contract - ~~1995.~~ JUNE 2006

The information is subject to change without notice. If you have any further questions, please contact the undersigned at (978)-663-6973.

Very truly yours,

George S. Thayer
Chief Design Engineer

enc.



GUILFORD TRANSPORTATION INDUSTRIES

BOSTON & MAINE CORPORATION

MAINE CENTRAL RAILROAD COMPANY

SPRINGFIELD TERMINAL RAILWAY CO.

SECTION I

General Information

GTI - Rail Division
Engineering Department

January 1995

I. GENERAL INFORMATION

A. Initial Contact:

Guilford Transportation Industries-Rail Division (Boston and Maine Corp., Maine Central Railroad Company, and the Springfield Terminal Railway Company) owns rail lines in New England and the Northeast. In 1976 a portion of the Boston and Maine was sold to the Massachusetts Bay Transportation Authority, but is still operated over by the B&M. The B&M System and the MBTA sale is shown on the system map entitled "Boston and Maine Corp. - Lines Operated", at the end of this section. The sale consists of lines primarily North and Northwest of Metropolitan Boston, within the Commonwealth of Massachusetts.

Projects contemplated upon lines owned by GTI-Rail Division, the submission of plans and specifications should be made to the attention of the Chief Engineer-Design and Construction, GTI-Rail Division at the operating Railroad's headquarters. Also all legal documents and agreements should be made with the operating Railroad.

If the project contemplated is upon a line owned by the MBTA and operated by the B&M, the submission of plans and specifications should be made to the Chief Engineering Officer - Railroad Operations, MBTA, Ten Park Plaza, Boston, MA 02116 with a copy to the B&M Attention: Chief Engineer-Design and Construction.

B. Plans and Specifications:

1. SCOPE: It is the intent of the Railroad to eliminate or minimize any risk involved with construction on or affecting Railroad property. Therefore, we require Railroad approval of the plans and specifications for all phases of the proposed construction. The initial submission should contain three (3) sets for review with a later submission of five (5) sets for final approval.

2. PLANS: The plans are to show all the work which involves the Railroad (in some cases a partial set of the construction plans may be acceptable). They should contain a location map, a plan view of the project, with appropriate profiles and cross sections, and sufficient details. The proposed construction is to be located with respect to top of rail and centerline of track. Also to be included on the plan is Railroad stationing, property lines and subsurface soil conditions. The subsurface soils information is to be in the form of boring logs with the borings located on the plan view. (Please familiarize yourself with Railroad policy with regards to obtaining borings on Railroad property in Section II A.)

All pipe laid on Railroad property, adjacent to operating tracks must be capable of withstanding Railroad live loading. If reinforced concrete pipe is used, it must be Class 5 R.C. Pipe.

Pipe sleeves under Railroad tracks and along the right-of-way shall not be less than 5'6" below the base of rail. Under secondary or industry tracks, this distance may be reduced to 4'6", pending Railroad approval. The length of the pipe sleeve shall be the greatest length produced from the Railroad requirements shown on sheet 5, entitled "GTI Rail Division Requirements for Minimum Jacking Sleeve Lengths".

3. SPECIFICATIONS: The Specifications contained in Section III are the Standard Specifications of the Railroad. They apply to all types of construction work on the Railroad, including steel sleeves 30" in diameter and greater. These specifications are to be included in their entirety as a special section on the job specifications.

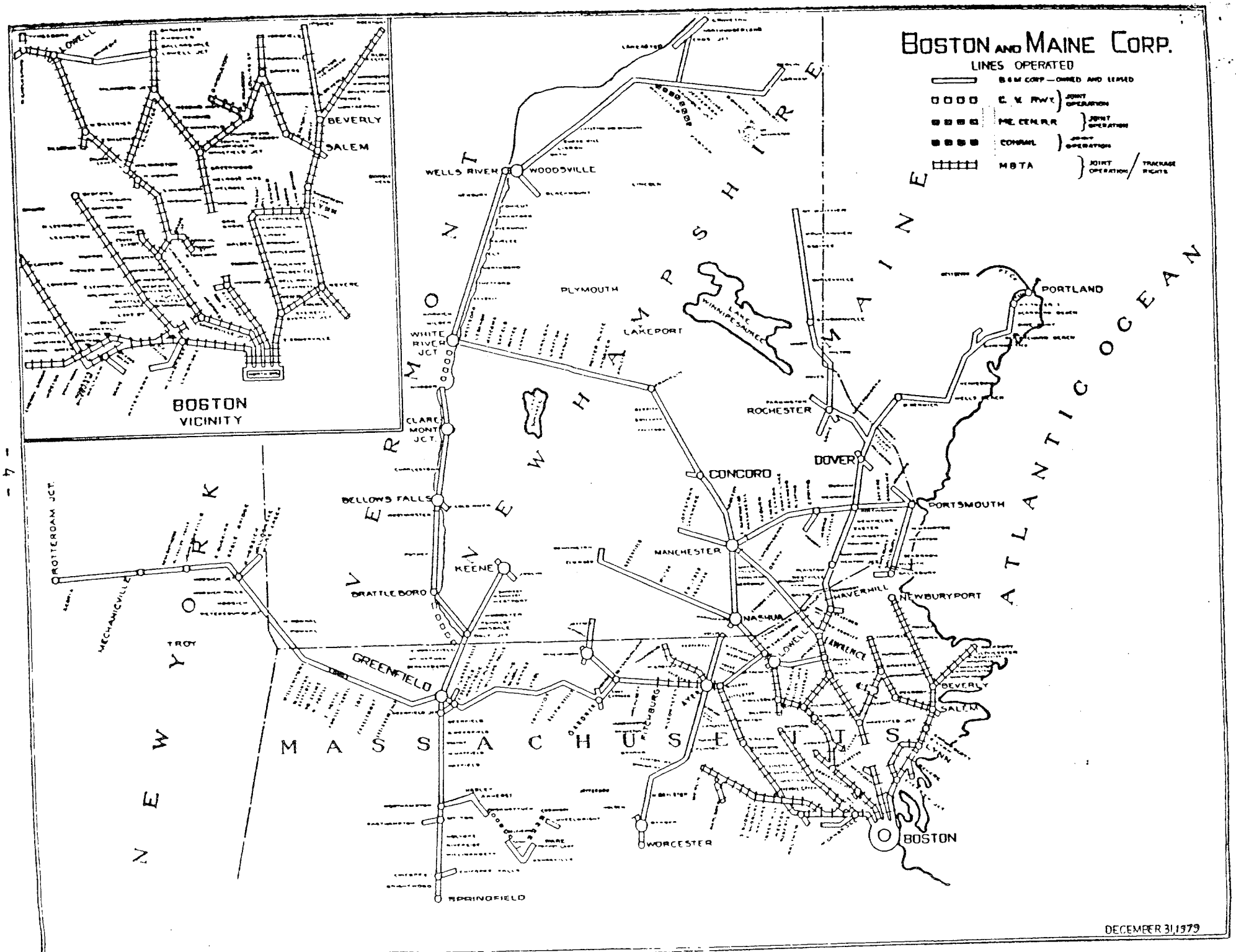
NOTE: Railroad specifications are the minimum requirements. In the event the contract specifications or drawings demand more stringent requirements, then, pending Railroad approval, the more stringent requirements will prevail.

On those projects which occur on MBTA property, the Standard MBTA Specifications are to be used.

C. Review of Plans and Specifications:

1. Project on lines owned by GTI-Rail Division:

The GTI-Rail Division requires payment for services it renders in the review of plans, specifications and related consultations, to cover crossings, bridges, pipes, conduits, wires, etc. which encroach upon Railroad property. An initial advance lump sum nonrefundable deposit to cover the cost of review is required. The amount of deposit will be determined at the time the initial submission is made. No work will proceed until the advance deposit has been received. Checks are to be made payable to the Operating Railroad.


BOSTON AND MAINE CORP.
LINES OPERATED
B&M CORP—OWNED AND LEASED
C. V. RWY.
MEC. CENT. R.R.
CONRAIL
MBTA
JOINT OPERATION
JOINT OPERATION
JOINT OPERATION
JOINT OPERATION / TRACKAGE RIGHTS
BOSTON VICINITY
LOWELL
BEVERLY
SALEM
WELLS RIVER
WOODSVILLE
PLYMOUTH
LAKEPORT
LAKE WINNIPESAUKEE
WHITE RIVER JCT.
CLAREMONT JCT.
BELLOWS FALLS
KEENE
BRATTLEBORO
GREENFIELD
SPRINGFIELD
ROTTERDAM JCT.
MECHANICVILLE
TROY
CONCORD
MANCHESTER
NASHUA
ROCHESTER
DOVER
PORTSMOUTH
PORTLAND
HAVERHILL
NEWBURYPORT
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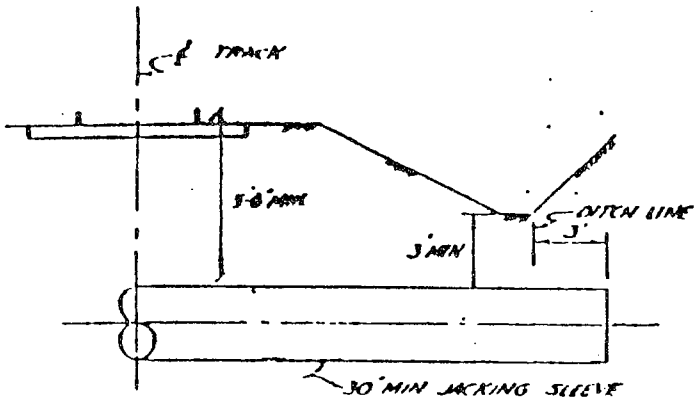
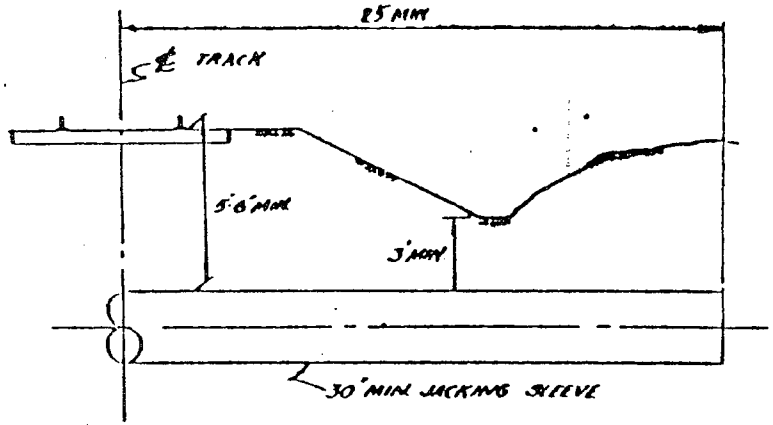
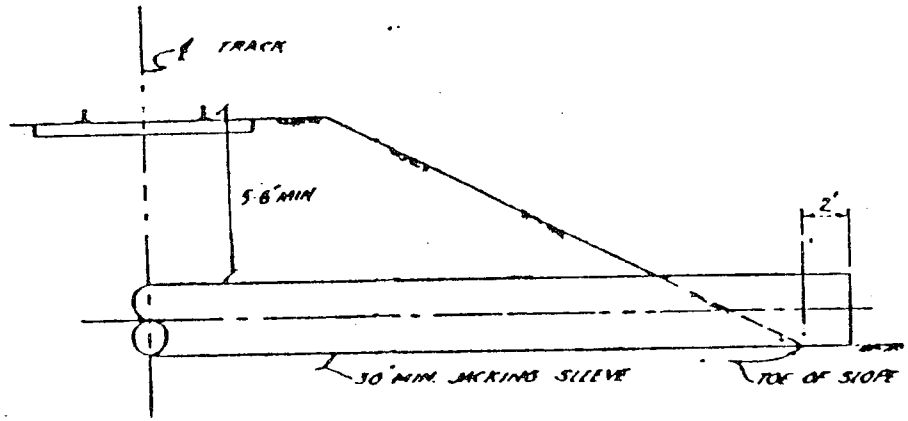
DECEMBER 31, 1979



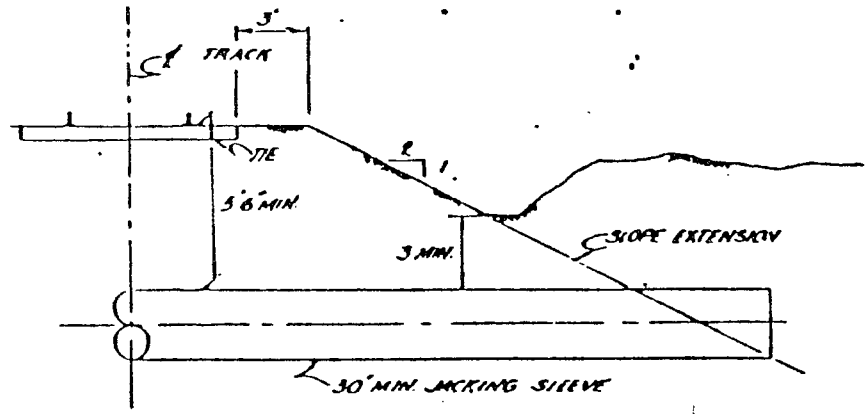
NO 1 GTI RAIL DIVISION REQUIREMENT
FOR MINIMUM JACKING SLEEVE LENGTH



NO 3 GTI RAIL DIVISION REQUIREMENT
FOR MINIMUM JACKING SLEEVE LENGTH



NO 2 GTI RAIL DIVISION REQUIREMENT
FOR MINIMUM JACKING SLEEVE LENGTH



NO 4 GTI RAIL DIVISION REQUIREMENT
FOR MINIMUM JACKING SLEEVE LENGTH

FOUR OF G.T.I RAIL DIVISION REQUIREMENTS FOR MINIMUM JACKING SLEEVE LENGTHS WITH 25 FEET AS THE ABSOLUTE MIN. FROM NEAREST ℄ TRACKS USE WHICH EVER OF THE FOUR (4) REQUIREMENTS GIVES THE GREATEST LENGTH.

SHEET 5

SECTION II

Railroad Policies

GTI - Rail Division
Engineering Department

January 1995

II. GTI-RAIL DIVISION POLICIES

A. Regarding obtaining Surface and Subsurface Information.

In the event that the property either operated or owned by GTI-Rail Division has to be entered upon to obtain surface or subsurface information, the contractor is to obtain Railroad approval for the boring locations, Railroad insurance, and execute the Standard Railroad Service Contract, prior to any work being done. The Assistant Chief Engineer-Design should be contacted for information and initiation of this process.

B. Regarding Underground Utility Crossings.

1. Method of Installation:

(a) In a Public Way: (No work shall be done without engineer approval by the Railroad and a Railroad Inspector present.)

1. In or immediately adjacent to an at-grade crossing which has been rebuilt within the past ten (10) years, no open cuts will be allowed. All sleeves will be installed by the jacking method.

2. In or immediately adjacent to an at-grade crossing not scheduled for rebuilding, the preferred method of installation is by jacking. As an alternate, the sleeve may be installed by open cut within an acceptable depth, with strict adherence to the backfill specifications, and with the Owners paying for the complete rebuilding of the crossing, train schedule permitting.

3. In or immediately adjacent to an at-grade crossing scheduled for rebuilding the preferred method of installation is by jacking. As an alternate, within seven (7) calendar days of the scheduled date of the crossing reconstruction, the sleeve may be installed by open cut within an acceptable depth, train schedule permitting. Strict adherence shall be made to the backfill specifications, which provides the Railroad with written certification from a testing lab or P.E. registered in the State in which the work is performed, that the backfill density requirements of the Railroad specifications have been met or exceeded.

(b) Not within a Public Way:

The accepted method of crossing the Railroad is by jacking of a pipe sleeve under the Railroad. Only upon written request, will an alternate of open cut be given consideration. The engineering decision shall be based upon, but not limited to track usage, depth of excavation, soil conditions, and physical constraints. In the event an open cut is allowed, the contractor or owner must adhere to the following items:

1. The installation is to be a continuous operation and performed to a Railroad approved schedule.

2. No work shall be done without a Railroad inspector present.

3. Strict adherence to the Railroad backfill specifications by the Owner or its Contractor.

4. The Owner or its Contractor is to provide the Railroad with a non-refundable, lump sum payment for after the fact maintenance. The determination of this amount is based on the individual situation. No work will be allowed until this payment is received. This payment is not to be confused with the advance deposit for Railroad protective services (flagging, inspection, etc.) also required from the Owner or its Contractor before he enters upon Railroad property. Checks are to be made payable to the Operating Railroad.

C. Regarding Insurance and Indemnification.

1. Before entering upon the property of the Railroad, the Owner or its Contractor shall:

(a) Provide insurance, as specified in the Railroad specifications. The original policy shall be provided to the Railroad. No work will be done until an acceptable policy has been received and approved. The Railroad shall have the right to increase the limits of liability for both public liability and property damage during the life of the agreement.

(b) The Contractor shall execute the Standard Railroad Service Contract which indemnifies and saves harmless the Railroad.

(c) Provide payment as shall be required by the Railroad's Real Estate Department for preparation of agreement(s) and review of insurance.

D. Regarding Legal Documents for Temporary and Permanent Installations on:

1. Railroad lines:

(a) Outside Public Ways:

The Owner is required to either obtain a License Agreement, which includes an annual rental charge, that may be terminated by either party by giving 30 to 90 days notice, or the Owner may apply for a permanent easement, which may or may not be approved by the Railroad.

(b) Within Public Ways:

The Owner is not required to obtain an easement from the Railroad or obtain a License Agreement from the Railroad to install a facility. However, the Owner is required to conform with the requirements of C-1a and C-1b, and the Standard Railroad Specifications.

2. MBTA lines operated and controlled by the Railroad:

(a) Outside Public Ways:

The legal requirements will be as determined by the MBTA, however, the Railroad will require written notification and copy of the Agreement from the MBTA, indicating that their requirements have been met prior to any work being initiated, and the Contractor to sign a Standard Railroad Service Contract.

(b) Within Public Ways:

The Owner is not required to obtain an easement from the Railroad or to obtain a License Agreement from the Railroad to install a facility. However, the Owner is required to conform with the requirements of C-1a and C-1b, and the Standard Railroad Specifications.

E. Regarding Permanent Clearances.

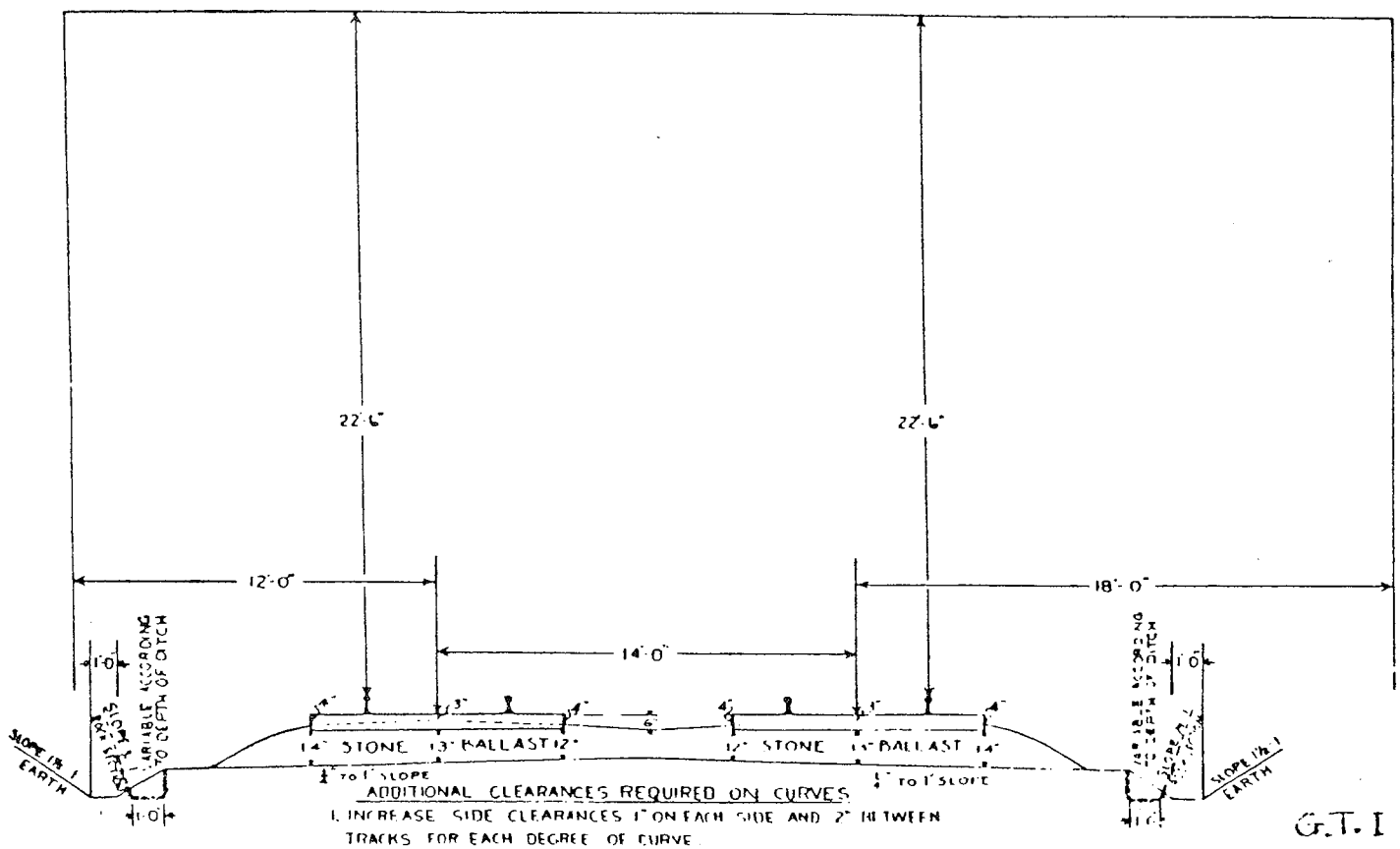
1. Railroad lines: All clearances for new construction shall adhere to those dimensions set forth on Standard Plan N8 entitled "GTI Rail Division Clearance Diagram New Bridge Construction". A copy of this standard plan is located at the end of this section. In the event of existing, severe limitations, the standard dimensions may be revised, at the discretion of the Railroad, but only upon written request.

2. MBTA lines operated and controlled by the Railroad.

(a) Railroad freight operations - The Chief Engineering Officer, GTI Rail Division, shall determine the clearance dimensions required for freight service.

PLAN	
DRAWN NEW	
CHECKED FOR	
CORRECT FOR	
ISSUE	DATE
A	5/25/77

N8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SECTION III

Standard Railroad Specifications

GTI - Rail Division
Engineering Department

January 1995

SPECIFICATIONS RELATING TO WORKING WITHIN PREMISES USED AND CONTROLLED BY GTI-RAIL DIVISION

No other section of the Project Specifications shall supersede or modify this Section entitled: SPECIFICATIONS RELATING TO WORK WITHIN PREMISES USED AND CONTROLLED BY GTI-RAIL DIVISION.

1. DEFINITIONS

1.1 Railroad:	The word "Railroad" means Guilford Transportation Industries-Rail Division; Boston and Maine Corporation, Maine Central Railroad Company, and the Springfield Terminal Railway Company, their successors or assigns and their officers, agents and servants.
1.2 Owner:	The word "Owner" means the individual, utility, government, or corporation who has title to the structure to be constructed upon property owned, controlled, or adjacent to the Railroad.
1.3 Utility:	The word "Utility" includes public or private communication, water, sewer, electric, gas and petroleum companies.
1.4 Government:	The word "Government" includes State, Town, City, County and other forms of Municipal Government.
1.5 Corporation:	The word "Corporation shall mean any firm duly incorporated under laws of a State Government.
1.6 Individual:	The word "Individual" shall mean any party which is not defined by 1.3, 1.4, or 1.5.
1.7 Contractor:	The word "Contractor" means the individual, partnership, firm, corporation or any combination thereof, or joint venture, contracting with either a Utility, Government, Corporation or Individual, for work to be done on Railroad Property.
1.8 Owner or its Contractor:	The term "Owner or its Contractor" as used in these specifications shall not affect the responsiblities of each party as set forth in the Project Specifications.
1.9 Chief Engineering Officer of the Railroad:	The Vice President of Engineering or Chief Engineer-Design and Construction or their authorized representatives at the Operating Railroads.

3.1.5 The Owner or its Contractor shall furnish to the Chief Engineering Officer of the Railroad for approval complete sequence and plans with sufficient detail for checking, for the installation of temporary supporting or removal of all members or structures above track. All such work shall be performed in accordance with the approved plans and specifications. All plans and calculations shall be stamped by a Professional Engineer registered in the State in which the work is to be performed.

3.1.6 The Owner or its Contractor shall give written notice to the representative of the Chief Engineer-Design and Construction of the Railroad at the headquarters of the Operating Railroad at least seven (7) days in advance of starting work or locating equipment at the site. In addition, the Contractor shall give notice on the Wednesday, prior to the week he proposed to do work which might cause any hazard, as described under Section 4.

3.1.7 The Owner or its Contractor shall make all necessary arrangements with the Railroad before entering upon Railroad premises, or Property used and controlled by the Railroad.

3.1.8 The Owner or its Contractor shall at all times be aware that the Railroad may at any time withhold entry due to lack of flagging and/or inspection personnel.

3.2 After entering upon Railroad premises or property used and controlled by the Railroad:

3.2.1 The Owner or its Contractor shall have in his possession on the job site the contract plans and specifications which bear the stamp of approval of the Railroad's Engineer of Design. The Owner or its Contractor shall conduct all his work according to these plans and specifications.

3.2.2 All work shall be performed and completed in a manner fully satisfactory to the Railroad's Chief Engineering Officer or his authorized representatives. Railroad inspection of the work shall be permitted at all times and the Owner or its Contractor shall cooperate fully with the Railroad representatives.

3.2.3 All equipment used by the Owner or its Contractor on Railroad premises or property used and controlled by the Railroad may be inspected by the Railroad and shall not be used if considered unsatisfactory by the Railroad's representative. Equipment of the Owner or its Contractor to be used adjacent to tracks shall be in first class condition so as to positively prevent any failure that would cause delay in the operation of trains or damage to Railroad facilities. Equipment shall not be placed or put into operation adjacent to a track without first obtaining the permission of the Railroad.

3.2.4 Operators of such equipment may be examined by the Railroad representative to determine their fitness. If it is determined that they are unfit to work then the owner or its Contractor shall remove them from service.

3.2.5 If the Chief Engineering Officer of the Railroad deems it necessary, the Owner or its Contractor shall furnish and erect in close proximity to the site of the work a suitable, furnished shelter with lights, heat, telephone, etc., exclusively for Railroad personnel mentioned previously.

3.2.6 The Owner or its Contractor's work shall be performed in such manner that the tracks, traffic and appurtenances of the Railroad will be safeguarded. He shall ascertain and comply with the requirements of the Railroad relative to his work on or adjacent to Railroad premises and except as permitted, he shall keep the tracks clear of obstruction.

3.2.7 Open excavations shall be suitably planked over when construction operations are not in progress.

3.2.8 Blasting will be permitted under or adjacent to tracks only after proof that blasting is required and all methods have been submitted to and approved by the Railroad's Chief Engineering Officer.

3.2.9 The Owner or its Contractor shall be fully responsible for all damages arising from his failure to comply with the requirements of these specifications.

3.2.10 If the specifications of the Railroad and the Consulting firm differ, then that which is more stringent shall prevail.

4. HAZARDS:

4.1 The Contractor's attention is called to the fact that the work under the Contract shall be performed adjacent to _____tracks, telephone lines, telegraph lines, signal lines and electric supply lines of the Railroad. A maximum speed of about_____miles per hour will be considered as prevailing for the operation of trains of the Railroad at this project.

(Missing data to be determined on an individual basis.)

4.2 An operating track shall be considered fouled and subject to hazard when any object or operation is or can be brought nearer than 15 feet to the center line of the track. Specific site conditions may increase this dimension at the discretion of the Chief Engineer or his authorized representative.

4.3 A signal line or communication line shall be considered fouled and subject to hazard when any object is brought nearer than 4 feet to any wire or cable.

4.4 An electrical supply line shall be considered fouled and subject to hazard when any object is brought nearer than 10 feet to any wire of the line.

4.5 Cranes, trucks, power shovels, or any other equipment shall be considered as fouling a track, signal line, communication line, or electric supply line when working a position that failure of equipment with or without load could foul the track, signal line, communication line or electric supply line.

4.6 Railroad operations will be considered subject to hazard when explosives are used in the vicinity of Railroad premises, during the driving or pulling of sheeting for footings adjacent to a track, when erecting structural steel across or adjacent to a track, when operations involve swinging booms or chutes that could in any way come nearer than 15 feet to the center line of a track or wire line. None of these or similar operations, therefore, shall be carried on during the approach or passing of a train.

4.7 When, in the opinion of the Chief Engineering Officer of the Railroad or his representative the construction work would cause hazard to the safe operation of trains or to other Railroad facilities including any communication lines on Railroad premises, the Railroad will employ the necessary qualified employees to protect its trains and other facilities.

5. CLEARANCES:

Staging, falsework, or forms shall at all times be maintained with a minimum vertical clearance of _____ above top of the high rail and a minimum side clearance of _____ from the center line of track. (Missing data to be determined on an individual basis.)

6. PROTECTION/INSPECTION SERVICES:

6.1 If deemed necessary by the Chief Engineering Officer of the Railroad the Railroad will furnish and assign an engineer (s) or inspector (s) for general inspection purposes or for general protection of Railroad property and operations during construction. Prior to start of any work on the Railroad, the Owner or its Contractor shall submit a deposit in the amount required by the Railroad. If Railroad expenses are greater than the amount of deposit, the Owner or its Contractor shall reimburse the Railroad for the balance when billed. If the Railroad expenses are less than the amount of deposit, the Railroad will refund the balance to the Owner or its Contractor, provided the Railroad receives a written request for a refund within sixty days (60) days of the completion of work on Railroad property. The Railroad will provide at its sole discretion such personnel as it deems necessary or advisable because of the project. The Railroad reserves the right to request additional deposits as project work progresses. All checks are to be made out to the Operating Railroad.

NOTE: A minimum of three (3) days notice is required for the obtaining of flagging personnel.

6.2 If the Railroad determines that flagmen are necessary, the number required shall be on duty at the site during the hours of hazard described under Section 4. No work shall be performed if flagmen are required but not on duty.

6.3 It shall be the responsibility of the Owner or its Contractor to keep the Railroad informed at all times, and prior to such times, when the Owner or its Contractor shall be working on, above, or adjacent to the Railroad creating the hazards described under Section 4. Failure of the Owner or its Contractor to give the Railroad suitable advance notice of hazardous operation shall result in the stoppage of the Owner's or its Contractor's work by the Railroad, until such time as sufficient number of flagmen are on duty at the site.

7. EXTRA-CONTRACT SERVICES:

7.1 Temporary and permanent changes of tracks and telephone lines, telegraph lines, signal lines, and electric supply lines made necessary by or to clear the permanent work of the Contractor will be made or caused to be made by the Railroad at the expense of the Owner or its Contractor.

7.2 All other changes made or services furnished by the Railroad, at the request of the Owner or its Contractor will be at the Owner's or its Contractor's expense.

8. INSURANCE:

8.1 At his sole expense the Owner or its Prime Contractor shall obtain, prior to working adjacent to Railroad premises and entry upon Railroad premises and keep in force during entire term of the work and for six (6) months subsequent to completion of work the following amounts and kinds of insurance. All policies shall be written for a minimum of one (1) year:

(A) Work on GTI-Rail Division Property:

1. Contractors Public Liability - $5,000,000/$10,000,000
2. Contractors Property Damage Liability - $5,000,000/$10,000,000
3. The named insured shall be written exactly as follows: "The Boston and Maine Corporation and The Springfield Terminal Railway Company, their affiliates, successors and assigns, c/o Guilford Transportation Industries, Inc., Iron Horse Park, North Billerica, MA 01862."

(B) Work on MBTA Property or other property where MBTA passenger service is operated:

1. Contractors Public Liability - $5,000,000/$10,000,000
2. Contractors Property Damage Liability $ 5,000,000/$10,000,000
3. The named insured shall be written exactly as follows: "The Boston and Maine Corporation and The Springfield Terminal Railway Company, their affiliates, successors and assigns, and the Massachusetts Bay Transportation Authority."

The insurance shall be a Railroad Protective Liability Policy in a form acceptable to the Railroad.

The ORIGINAL insurance policy shall be furnished to the Real Estate Department of the Railroad at least ten (10) days prior to commencement of work. The Railroad shall have the right to increase the limits of liability for both public liability and property damage during the life of the agreement.

9. EXCAVATION:

9.1 The Owner or its Contractor shall furnish detail plans for falsework, bracing, shoring, sheeting, or other supports for excavation adjacent to the tracks to the Chief Engineering Officer of the Railroad for approval. The work shall be performed in accordance with the approved plans. No approval shall be given until the advance deposit (Item 6.1) has been received.

9.2 Open excavations shall be suitably planked over when construction operations are not in progress.

9.3 As excavation approaches pipes, conduits, or other underground structures on or adjacent to Railroad property, digging by machinery shall be discontinued and the excavation shall continue by means of hand tools.

9.4 All existing pipes, poles, wires, fences, property line markers, and other structures, which the Railroad's Chief Engineering Officer decides must be preserved in place without being temporarily or permanently relocated shall be carefully protected for damage by the Owner or its Contractor. Should such items be damaged, they shall be restored by the Railroad, at the Owner's or its Contractor's sole expense, to at least as good condition as that in which they were found immediately before the work was begun.

9.5 If any excavation is taken beyond the work limit indicated on the approved plans or prescribed herein, the Owner or its Contractor shall backfill and compact as presecribed herein at his own expense.

10. BACKFILL

10.1 Material

The material shall consist of stones, rock fragments and fine, hard durable particles resulting from the natural disintegration of rock. The material shall be free from injurious amounts of organic matter. The wear shall be not more than 60 percent. The material shall consist of a mixture of stones or rock fragments and particles with 95 to 100 percent passing the 3 inch sieve and 25 to 70 percent passing the No. 4 sieve. Not more than 15 percent of the material passing the No. 4 sieve shall pass the No. 200 sieve.

10.2 Backfilling

10.2.1 All backfill material adjacent to a pipe shall be approved soil. Backfill material shall be free from hard lumps and clods larger than 3 inch diameter, and free from large rocks or stumps. Uniformly fine material shall be placed next to any pipe liable to dent or break.

10.2.2 All backfill material shall be compacted at near optimum moisture content, in layers not exceeding 6 inches in compacted thickness by pneumatic tampers, vibrator compactors, or other approved means to the base of the Railroad subgrade. Care shall be exercised to thoroughly compact the backfill under the haunches of the pipe to insure that the backfill soil is in intimate contact with the side of the pipe. Fill at the sides of the pipe may be compacted by rolling or operating heavy equipment parallel with the culvert, provided care is taken to avoid displacement or injury of the pipe. Material in the vicinity of pipes shall be compacted to not less than 95 percent of AASHO T 99, Method C. The Contractor will be required to supply, to the job site, ballast stone as prescribed herein to be installed by the Railroad.

10.3 Certification

The Owner or its Contractor shall provide testing, through the use of a testing lab or Professional Engineer registered in the State in which the work is performed, to insure that the in place density of the backfill meets or exceeds the requirements of Section 10.2.2. Written certification of the tests shall be given to the Railroad immediately upon completion of the test.

11. BALLAST STONE

11.1 Material

Ballast shall consist of crushed stone with zero to fifteen percent passing a 1" screen, ninety to one hundred percent passing a 1.5" screen and one hundred percent passing a 2" screen.

11.2 Installation

The ballast stone shall be installed by Railroad forces according to Railroad Standards.

12. STEEL SLEEVE REQUIREMENTS FOR JACKING OPERATIONS

12.1 The outside diameter of the casing pipe shall be a minimum of thirty-six (36) inches (900 mm) with a minimum of six (6) inches (150 mm) greater than the largest outside diameter of the carrier pipe, joints or coupling.

12.2 The casing pipe shall be designed to withstand Coopers E-80 Railroad loading. Refer to the table below for nominal minimum thickness of steel sleeve required for a specific casing pipe diameter.

DIAMETER (inch)	DIAMETER (mm)	THICKNESS (inch)	THICKNESS (mm)
36	850 - 900	0.532	14
38 - 44	950 - 1100	0.569	15
46 - 50	1150- 1250	0.688	18
52 - 54	1300- 1350	0.813	21
60 - 66	1500- 1650	0.876	22
>66	>1676	investigate use of steel liner plate	

12.3 The casing pipe shall have a minimum yield strength of 35,000 psi (241325 kpa) and conform to the latest revisions of the requirements of A.W.A. Standards for fabricating electrically welded steel water pipes or its equivalent.

12.4 Method of Installation

12.4.1 The Owner or its Contractor shall submit to the Chief Engineering Officer, data and information demonstrating that he or his subcontractor has had successful previous experience in jacking in similar circumstances.

12.4.2 Before any work is begun within the limits of jacking the Owner or its Contractor shall have assembled all tools, materials and equipment which will be required. When the Owner or its Contractor has started the jacking operation, he will proceed in a continuous operation without stopping. This will minimize the tendency of the material to freeze around the pipe.

12.4.3 A jacking shield shall be used and jacked ahead of the casing pipe. The excavation within the jacking pipe should not advance beyond the head of the pipe shield. If the stability at the face needs to be maintained from raveling or running soil, suitable temporary bulkheads, struts and bracing shall be required. After completion of the sleeve installation the anular space around it shall be completely grouted with cement grout under pressure.

12.5 Method of Joining Casing Pipe Ends

The casing pipe shall be jacked without being welded through the use of a collar plate as shown on the sheet entitled, "Method of Jacking and Joining the Steel Sleeve Sections". Upon completion of the jacking operation either the continuous butt weld will be performed or a continuous interior collar plate is to be provided as shown.

Alternate Method:

Casing pipe ends shall be beveled with a single V-groove for field welding. Pipe joints shall be butt welded and shall be a full penetration on the outside circumference of the pipe. The single V-groove butt weld shall conform to the latest A.W.S. Welding Code. All joints of the casing pipe shall be butt welded, by a certified welder, prior to being subject to the jacking operation.

13. GROUND STABILIZATION

If required, it shall be done to the soil prior to the start of jacking. Stabilization shall be by either dewatering or grouting or combination of both to maintain the stability of the face of the heading.

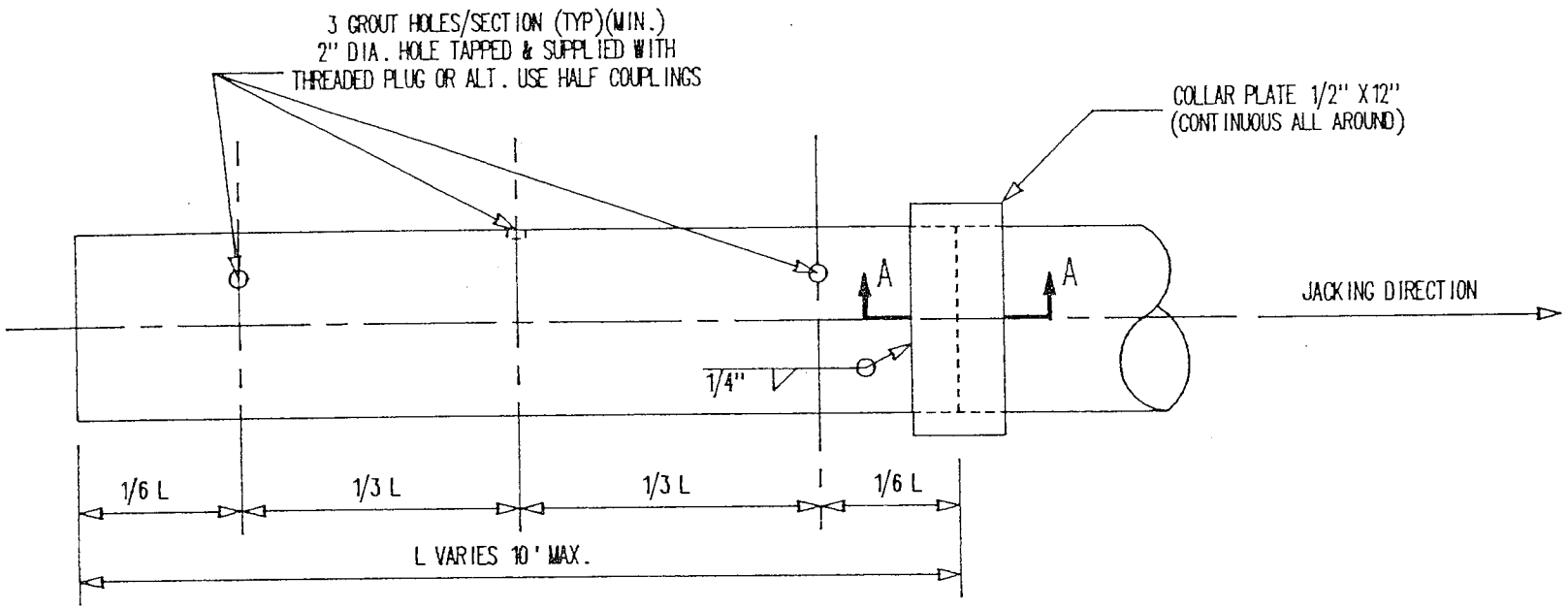
13.1 Dewatering

The Owner or its contractor shall lower and maintain the ground water level a minimum of 2 feet below the invert at all times during construction by well points, vacuum well points, or deep wells to prevent inflow of water or water and soil into the heading. Ground water observation wells shall be installed in the area to be dewatered to demonstrate that the dewatering requirements are being complied with.

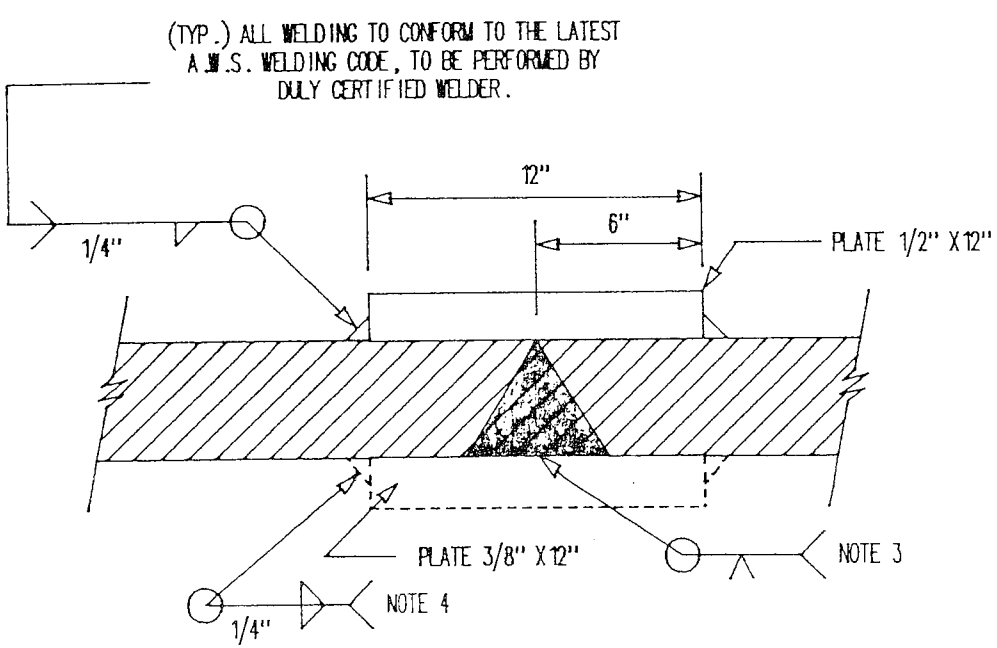
13.2 Grouting

The grouting contractor shall be a specialist in the field with a minimum of five (5) continuous years of successfully grouting soils. All granular soils (silty sands, sand or sand and gravel) shall be stabilized by injection of a cement or chemical grout from the ground surface or from the pipe heading. The stabilization shall extend as far as necessary outside the periphery of the casing pipe in order to maintain a stable face at the heading.

13.3 Knowing that dewatering can cause settlement, it will be necessary that Railroad forces survey the crossing prior to, during and after construction. If it is found the tracks need to be aligned and surfaced by the Railroad forces because of the construction, the cost of this shall be borne by the Owner, or if so designated, by the Owner's Contractor.



STEEL JACKING SLEEVE DETAIL



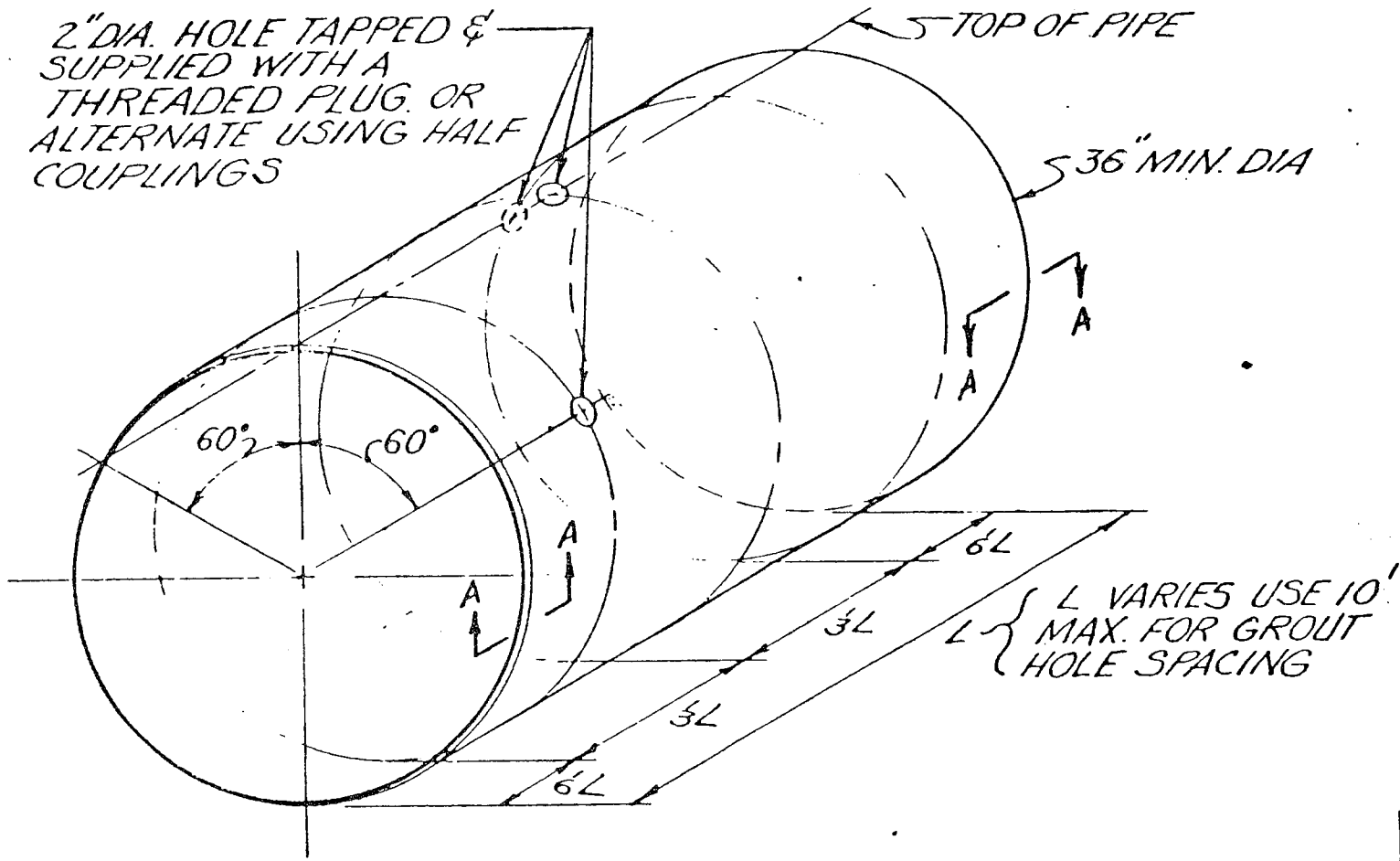
SECTION A-A

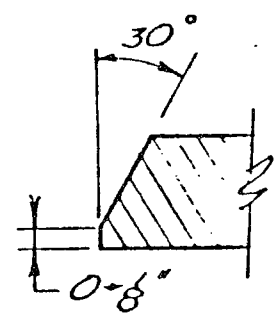
NOTES:

1. STEEL SLEEVE TO BE 30" MIN. DIA.
2. STEEL SLEEVE TO BE BEVELED ON THE INTERIOR OF THE PIPE.
3. THE CONTINUOUS BUTT WELD SHALL BE PERFORMED WHEN THE JACKING OPERATION IS FINISHED. (FOR ALTERNATE TO BUTT WELDING, SEE NOTE 4.)
4. AS AN ALTERNATE TO NOTE 3, PROVIDE A CONTINUOUS INTERIOR PLATE 3/8" X 12" WELDED ALL AROUND UPON COMPLETION OF THE JACKING OPERATION.

METHOD OF JACKING & JOINING
STEEL SLEEVE SECTIONS

BOSTON & MAINE CORP. DATE: 5/09/90 BY: DGR





STEEL SLEEVE

GROUT HOLES W/ THREADED PLUGS SHALL BE PROVIDED IN THE STEEL SLEEVE. A MINIMUM OF 3 GROUT HOLES WILL BE REQUIRED PER A 10 FOOT (MAX.) SECTION OF STEEL SLEEVE.

SECTION A-A

BY: D. IVANOV

DATE: 5-23-79

SHEET:

STANDARD REQUIREMENTS FOR AERIAL WIRE CROSSINGS

14.1 All requirements of the latest edition of the Standard Railroad Specifications shall apply to wire crossings over Railroad property and longitudinal occupation of Railroad property. The Standard Railroad Specifications should be included in the project specifications, if there are project specifications; otherwise the drawings should include the note:

> "All work shall be performed in accordance with the latest edition of the Standard Railroad Specifications of the GTI Rail Division."

14.2 The drawings should be to scale and should include a plan and a profile. The plan should show a North arrow and the profile should be perdendicular to the tracks.

14.3 All Railroad property lines should be shown on the drawings.

14.4 All public right-of-way boundaries, and other property lines should be shown on the drawings.

14.5 The drawings should indicate the Railroad valuation map number and the Railroad stationing at the centerline of crossing.

14.6 Low voltage conductors should have a clearance of at least 27 feet above the top of rail.

14.7 High voltage conductors should have a clearance of at least 28 feet if above 750 volts and 30 feet if above 15 KV. Conductors with voltages above 50 KV will be considered on an individual basis.

14.8 All poles should be located with respect to the centerline of the nearest track and should be labeled as proposed or existing. (Distances should be given perpendicular to the centerline of track.)

14.9 All drawings should be stamped by a Professional Engineer or Land Surveyor registered in the State(s) where the project is located.

14.10 In order for the Railroad to protect its operations and properties, additional requirements may be imposed, at any time, by the Railroad.

All Items not addressed by the Guilford Transportation Industries-Rail Division's Standard Railroad Specifications shall conform to the latest specifications set forth in the American Railway Engineering Association's Manual for Railway Engineering.

BOSTON AND MAINE CORPORATION
SPRINGFIELD TERMINAL RAILWAY COMPANY

RAILROAD SERVICE AGREEMENT

AGREEMENT made as of this day of , 2006 by and between the "Railroad" as described in paragraph 1.A. below and "Contractor" as described in paragraph 1.B. below.

In consideration of the mutual promises, covenants and undertakings contained herein, and other good and valuable consideration, the receipt and sufficiency of which the parties hereby expressly acknowledge, the parties agree as follows:

1. The following terms shall have the meanings specified whenever used in this Agreement:

A. RAILROAD:

Boston and Maine Corporation and
Springfield Terminal Railway Company
c/o Guilford Transportation Industries, Inc.
Iron Horse Park
North Billerica, Massachusetts 01862

B. CONTRACTOR: The following described party, together with its agents, servants, employees, subcontractors, suppliers, consultants and engineers:

C. PROPERTY:

D. RAILROAD SERVICES: The Railroad shall perform such services and provide such equipment and materials which it deems, in its sole discretion, necessary for the safe performance by the Contractor of the Construction Project, including, without limitation, the performance of all preliminary, office and field engineering; internal record keeping and accounting; railroad flagging and signaling; restoration of replacement of the Railroad's track or ballast; and all railroad inspection; and the Railroad shall provide all railroad communication equipment and materials.

E. INITIAL RAILROAD SERVICE FEE: To be invoiced by the Engineering Department of the Railroad.

F. CONSTRUCTION PROJECT:

G. TERM: One (1) year from the date first written above or completion of the construction project whichever occurs first.

H. **EXHIBITS:** The following Exhibits annexed hereto are hereby incorporated in this Agreement by this reference:

Intentionally omitted.

2. **ENTRY UPON RAILROAD PROPERTY.** The Railroad hereby agrees to permit the Contractor to enter upon the Railroad Property for the Term for the limited purpose of performing the Construction Project, provided that the Contractor complies with all of the several terms, conditions and covenants contained in this Agreement, the Construction Project hereinabove described, and all work requirements and directions of the Vice President-Engineering of the Railroad, or his authorized representative (the "Vice President-Engineering").

3. **RAILROAD SERVICES.** In connection with the Contractor's performance of the Construction Project, the Railroad shall provide the Railroad Services.

4. **RAILROAD SERVICE FEES.** In consideration of the performance by the Railroad of the Railroad Services, the Contractor shall pay to the Railroad the Initial Railroad Service Fee. The Railroad hereby reserves the right to require additional Railroad Service Fees for Railroad Services necessary to complete the Construction Project. The Contractor further agrees to pay the Railroad a non-refundable fee of five hundred ($500.00) dollars as reimbursement for the costs and expenses incident to the preparation of this Agreement.

5. **NOTICE OF INTENTION TO COMMENCE THE CONSTRUCTION PROJECT.** The Contractor shall provide the Vice President - Engineering of the Railroad with seven (7) days' notice in advance of its intention to commence the Construction Project.

6. **COVENANTS OF THE CONTRACTOR.** The Contractor hereby covenants and agrees that it will observe the following affirmative and negative covenants during the term of this Agreement:

(a) The Contractor shall perform the Construction Project in a safe, good and workmanlike manner and in accordance with the description of the Construction Project herein contained and all work requirements and directions of the Vice President-Engineering.

(b) The Contractor shall permit to enter upon the Railroad Property and perform the Construction Project only those contractors and/or subcontractors having, in the exclusive opinion of the Vice President-Engineering, sufficient engineering, construction expertise and financial ability to accomplish the Construction Project. The Railroad shall have the right to disqualify any contractor or subcontractor employed by the Contractor from performing the Construction Project for the following reasons:

(i) Failure to pay in full Moines owed to the Railroad; or

(ii) Use of, or reputation for use of, construction methods or procedures which, in the exclusive opinion of the Vice President-Engineering, are unsafe, technically deficient, or not in compliance with the Railroad's standards.

Any contractor or subcontractor so disqualified by the Railroad shall immediately vacate the Railroad Property and shall not re-enter the Railroad Property without the prior written approval of the Vice President-Engineering.

(c) The Contractor shall not, at any time, except with the prior approval of the Vice President-Engineering, enter upon the Railroad Property or perform the Construction Project without the presence at the Railroad Property of a foreman, inspector, or flagman as may be assigned or required by the Vice President-Engineering, in his exclusive opinion.

(d) The Contractor shall procure and maintain, at its sole cost and expense, the following insurance coverage's naming the Railroad, exactly as designated in Paragraph 1, as insured, in forms and with companies and coverage limits satisfactory to the Railroad:

(i) Comprehensive General Liability Insurance protecting against liability from bodily injury or property damage arising out of the Construction Project.

(ii) Workers Compensation and Occupational Disease Insurance, as required by law.

(iii) Automobile Liability Insurance covering all motor vehicles used about or in connection with the Construction Project.

(iv) Railroad Protective Liability Insurance.

(e) The Contractor shall procure and maintain, at its sole cost and expense, all permits, licenses and approvals of all governmental authorities and all consents of all third parties necessary for the Contractor to perform the Construction Project. The Contractor shall comply with, and shall cause the Railroad Property to comply with, all applicable local, county, state or federal laws, codes or ordinances of any description, including, but not limited to: zoning, building, engineering, sanitation, health or environmental laws, particularly, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. 9601, et seq., as amended) ("Law"). The Contractor shall promptly remedy any breach of any Law.

7. **INTERRUPTION OF CONSTRUCTION PROJECT.**

(a) Upon demand by the Railroad, the Contractor hereby agrees to immediately:

(i) Cease performance of the Construction Project;

(ii) Clear the Railroad Property of all personnel, materials, equipment or obstructions and render the Railroad Property safe for the passage of trains; and

(iii) Vacate the Railroad Property until such time as the Railroad gives notice of permission to re-enter the Railroad Property.

(b) In the event that the Contractor ceases work on the Construction Project, for any reason whatsoever, the Contractor shall provide notice of the same to the Vice President-Engineering and shall leave the Railroad Property in a safe condition, satisfactory to the Vice President - Engineering.

8. **PRIORITY OF RAILROAD OPERATIONS.** The operations of the Railroad, Guilford Transportation Industries, Inc. ("Guilford"), the affiliated railroads of Guilford, (in general, and those running through the Railroad Property in particular) and the operations of the lessees, licensees and other lawful occupants of the Railroad Property shall have absolute priority over the performance of the Construction Project. The Contractor hereby agrees that the Construction Project shall be performed only at such hours and times and under such conditions as specified by the Railroad. Such hours and times shall be subject to change without prior notice to the Contractor. The Contractor hereby acknowledges and agrees that the Contractor may suffer delays and increased costs due to said agreed upon priority of the Railroad's and others' operations. Causes for such delay and increased cost may include: (i) the inability or default of the Railroad in providing adequate personnel to allow work; and/or (ii) passage of trains. The Parties agree that had the Contractor desired to proceed with the work without being subject to the aforementioned delay and increased cost, the terms of this Agreement would have been substantially different, and per diem costs to the Contractor, depending on job location, rail traffic, etc. could have far exceeded the Railroad Service Fee.

9. **INDEMNIFICATION OF RAILROAD.**

(a) The Contractor hereby agrees to defend with counsel acceptable to the Railroad, release, indemnify, protect and hold harmless the Railroad, Guilford, their affiliates, successors and assigns, their lessees and licensees and all other lawful occupants of the Railroad Property from and against any and all loss, cost, damage, or expense arising in any way out of the Construction Project or Contractor's use or possession of the Railroad Property including, without limitation, (i) all claims or suits for loss or damage to property of any description or natural resources, (ii) personal injury, sickness or death of any person, (iii) delay damages, (iv) consequential damages, (v) all matters relating to the alteration of wetlands, (vi) breach of any Law, particularly any alleged release of oil or hazardous or otherwise harmful materials or substances (including, but not limited to costs for assessment, remedial or response actions), or (vii) other damages arising in any way out of the Construction Project or Contractor's use or possession of Railroad Property, whether such loss, cost, damage, or expense is suffered by the Contractor, the Railroad, Guilford, their affiliates, successors, assigns, lessees, licensees and all other lawful occupants of the Railroad Property, or the officers, agents employees, or representatives of any of them, or by others.

(b) In addition to the provisions above, the Contractor expressly agrees to assume responsibility for; and to release Railroad, Guilford and their affiliates from, any and all claims, costs, suits, judgments arising from or related to any actual, alleged or potential violations of any federal, state or local environmental law, regulation, rule, ordinance, or code discovered by Contractor in a manner that relates in any way to the performance of the Construction Project, including, but not limited to, any actual, alleged potential violations that existed prior to the execution of this Agreement.

(c) In the event that at any time during the performance of the Construction Project, the Contractor discovers any contamination or suspected contamination that triggers notification requirements under any applicable federal, state or local law, rule, regulation or ordinance, the Contractor agrees to promptly notify the Railroad, who will assume responsibility for performing any notification, if necessary, in accordance with good environmental practice, and if any further investigation or remediation is determined necessary the Railroad will perform the investigation and remediation. The Contractor agrees to to indemnify the Railroad of any and all costs associated with the environmental contamination. The Contractor shall be held solely responsible for the cost of any necessary investigation and/or remediation

10. **GENERAL PROVISIONS.**

(a) Any notice or other communication in connection with this Agreement shall be deemed duly served when received (or upon attempted delivery if delivery is not accepted). Such notice shall be in writing and either delivered by hand or mailed (i) by registered or certified mail (return receipt requested) with the United States Postal Service, or (ii) by Federal Express or other overnight mail carrier furnishing evidence of receipt to the sender, at the address for such party set forth in Section 1. Either party may change the address at which it is to receive notices by notice given as hereinabove set forth.

(b) Failure of the Railroad to complain of any act or omission hereunder on the part of the Contractor, no matter how long the same may continue, shall not be deemed a waiver by the Railroad of any of its rights hereunder. No waiver by the Railroad at any time, express or implied, of any breach of any provision of this Agreement shall ever be deemed a waiver of a breach of any other provision of this Agreement, or a consent to any subsequent breach of the same or any other provision. If any action by the Contractor shall require the Railroad's consent or approval, such consent or approval on any particular occasion shall not be deemed a consent or approval of any other action on any subsequent occasion.

(c) If any provision of this Agreement, or the application thereof to any person or circumstance, shall to any extent be invalid or unenforceable, the remainder of the Agreement, or the application of such provision to persons or circumstances other than those as to which it is invalid or unenforceable, shall not be affected. Each provision of this Agreement shall be deemed valid and enforceable to the fullest extent permitted by law.

(d) The Section headings contained in this Agreement are for reference and convenience only and in no way define or limit the scope and contents of this Agreement or in any way affect its provisions.

(e) This Agreement constitutes the entire understanding between the parties relating to the subject matter hereof, supersedes all prior oral and written offers, negotiations, proposals, representations, agreements, courses of dealing and understandings between the parties relating to the subject matter hereof and is subject to no understandings, conditions, or representations other than those expressly stated herein.

(f) This Agreement may only be amended or modified by a writing signed by all of

the parties hereto which refers to this Agreement.

(g) This Agreement shall be governed by and construed in accordance with the laws of the state wherein the Railroad Property is located.

(h) Neither party to this Agreement shall be responsible to the other for delays or errors in its performance or other breach of this Agreement occurring solely by reason of circumstances beyond its control, including acts of civil or military authority, national emergencies, fire, labor disputes, flood or catastrophe, acts of God, insurrection, war, riots, delays of suppliers, or failure of transportation, communication or power supply.

(i) The parties agree that neither this Agreement nor any memorandum thereof shall be recorded at any registry of deeds and that any such recording by the Contractor shall constitute a breach of this Agreement.

(j) If the Contractor executes this Agreement through an agent or representative, each such agent or representative hereby warrants and represents to the Railroad that he is authorized to execute, acknowledge, and deliver this Agreement on behalf of the Contractor and to thereby bind the Contractor to the same.

(k) This Agreement: (i) may be executed in any number of counterparts, each of which when executed by all parties to this Agreement shall be deemed to be an original, and all of which counterparts together shall constitute one and the same instrument, (ii) shall take effect as a sealed instrument, (iii) shall bind and inure to the benefit of the parties and their respective legal representatives, successors and assigns, except that the Contractor may not delegate any of its obligations under this Agreement or assign this Agreement without obtaining the Railroad's express written consent, and (iv) is not intended to inure to the benefit of any third party beneficiary.

(l) This Agreement shall not be construed as creating or vesting in the Contractor any estate in the Railroad Property, but only the limited right of using the Railroad Property in the manner hereinabove described.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as a sealed instrument as of the date first set forth above by their duly authorized representatives.

SPRINGFIELD TERMINAL RAILWAY COMPANY

By:_____
George S. Thayer,
Chief Design Engineer
Iron Horse Park
N. Billerica, MA 01862

BOSTON AND MAINE CORPORATION

By:_____
George S. Thayer,
Chief Design Engineer
Iron Horse Park
N. Billerica, MA 01862

Company Name

By:_____
Name:_____
Title:_____
Address:_____

Appendix K

MBTA Specifications

MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY

RAILROAD OPERATIONS DIRECTORATE

II

MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC

MAY 1994

SECTION 1. GENERAL

1.01 The contractor should note that these specifications govern proposed work that involves construction on, over, under, within or adjacent to MBTA Railroad Property. Requirements must be strictly observed whenever the tracks, structures, or properties of the MBTA are involved or affected.

1.02 If the tracks or other facilities of the MBTA are endangered, the Contractor shall immediately perform such work as directed by the Railroad Company(s), and upon failure of the Contractor to carry out such orders immediately, the Railroad Company(s) may take whatever steps are necessary to restore safe conditions. The cost and expense to the Railroad Company(s) and/or MBTA of restoring safe conditions or of any damage to the MBTA's trains, tracks, or other facilities caused by the Contractors' or subcontractors' operations, shall be at the sole expense of the Contractor and will be collected as appropriate. This cost shall be paid for by the Contractor and may be deducted from any monies due and that may become due to the Contractor.

1.03 Before entering upon MBTA Railroad Property:

A. The Owner or its Contractor shall be fully informed of all requirements of the MBTA pertaining to the specific project and shall conduct all his work accordingly. Any questions relating to the requirements of the MBTA should be directed to the Chief Engineering Officer of the MBTA or his authorized representative.

B. The Owner or its Contractor shall execute an MBTA License for Entry, and shall provide the MBTA and Railroad Company(s) with the information required in the "Insurance Specifications".

C. The Owner or its Contractor shall take note that if an excavation is to be made within a 2 to 1 slope line commencing 5.5 feet from the centerline of track, he shall submit the proposed method of soil stabilization for approval by the Chief Engineering Officer of the MBTA.

D. The Owner or its Contractor shall furnish detailed plans, for falsework, bracing, sheeting, or other supports adjacent to the tracks for approval by the Chief Engineering Officer of the MBTA and the Railroad Company(s), and the work shall be performed in accordance with "Temporary Sheeting and Shoring". All plans and calculations shall be stamped by a Registered Professional Engineer.

E. The Owner or its Contractor shall give written notice to the Chief Engineering Officer of the MBTA and the applicable Railroad Company(s)

at least 21 days in advance of starting work or locating equipment at the site.

F. The Owner or its Contractor shall make all necessary arrangements with the MBTA before entering upon MBTA Railroad Property.

1.04 After entering upon MBTA Railroad Property:

A. The Owner or its Contractor shall have in his possession on the job site the contract plans and specifications which bear the stamp of approval of the MBTA Chief Engineering Officer or Railroad Company(s). The Owner or its Contractor shall conduct all his work according to these plans and specifications.

B. All work shall be performed and completed in a manner fully satisfactory to the MBTA Chief Engineering Officer or authorized representative(s). Railroad Company(s) inspection of the work shall be conducted at any time and the Owner or its Contractor shall cooperate fully with the MBTA and Railroad Company(s) representatives.

C. All equipment used by the Owner or its Contractor on MBTA Railroad Property may be inspected by the Railroad Company(s) and shall not be used if considered unsatisfactory by the Railroad Company(s) representative. Equipment of the Owner or its Contractor to be used adjacent to tracks shall be in first class condition so as to positively prevent any failure that would cause delay in the operation of trains or damage to MBTA or railroad facilities. Equipment shall not be placed or put into operation adjacent to a track without first obtaining the permission of the Railroad Company(s).

D. Operators of such equipment must be properly licensed and may be examined by the Railroad Company(s) representative to determine their fitness. If it is determined that they are unfit to work, then the Owner or its Contractor shall remove them from MBTA Railroad Property.

E. If the Chief Engineering Officer of the MBTA deems it necessary, the Owner or its Contractor shall furnish and erect in close proximity to the site of the work a suitable, furnished shelter with lights, heat, telephone, etc., for use by Railroad Company(s) personnel providing services to the Owner's or Contractor's work.

F. The Owner or its Contractor's work shall be performed in such manner that the tracks, train operations and appurtenances of the MBTA and the Railroad Company(s) will be safeguarded.

G. Open excavations shall be suitably planked and safeguarded when construction operations are not in progress.

H. Blasting will be permitted under or adjacent to tracks only after proof that blasting is required and all methods have been approved by the MBTA's Chief Engineering Officer and the Railroad Company(s). All blasting operations must comply with the MBTA's "Blasting Specifications".

I. The Owner or its Contractor shall be fully responsible for all damages arising from their failure to comply with the requirements of these specifications. Failure to comply may result in their removal from MBTA Railroad Property, at the MBTA's sole discretion.

SECTION 2. RULES, REGULATIONS, ETC.

2.01 Railroad traffic shall be maintained at all times with safety and continuity, and the Contractor shall conduct all operations on, over, under, within or adjacent to MBTA Railroad Property within the rules, regulations, and requirements of the Railroad Company(s) and/or MBTA. The Contractor shall be responsible for acquainting himself with such requirements as the Railroad Company(s) and/or MBTA may demand.

2.02 The Contractor shall obtain verification of the time and schedule of track occupancy from the Railroad Company(s) before proceeding with any construction or demolition work on, over, under, within or adjacent to MBTA Railroad Property. The work shall not proceed until the plans and method of procedure have been approved by the Chief Engineering Officer of the MBTA or his authorized representative.

2.03 All work to be done on, over, under, within or adjacent to MBTA Railroad Property shall be performed by the Contractor in a manner satisfactory to the MBTA and the Railroad Company(s), and shall be performed at such times and in such manner, as to not interfere with the movement of trains or operations upon the tracks of the MBTA. The Contractor shall use all necessary care and precaution in order to avoid accidents, delay or interference with the MBTA's trains or other property.

2.04 The Contractor shall give written notice to the Railroad Company(s) at least twenty-one (21) days prior to the commencement of any work, or any portion of the work, by the Contractor or his subcontractors on, over, under, within or adjacent to MBTA

Railroad Property, in order that necessary arrangements may be made by the Railroad Company(s) to protect railroad operations.

2.05 If deemed necessary by the Railroad Company(s), it may assign an inspector and/or engineer who will be placed on the work site during the time the Contractor or any subcontractor is performing work on, over, under, within or adjacent to MBTA Railroad Property. The cost and expense will be paid directly by the contracting party with an advance deposit to the Railroad Company(s), unless otherwise approved.

2.06 Before proceeding with any construction or demolition work, on, over, under, within or adjacent to the MBTA's Railroad Property, a preconstruction meeting shall be held at which time the Contractor shall submit for approval of the MBTA and Railroad Company(s), plans, computations, and a detailed description of the method for accomplishing the construction work, including methods of protecting railroad operations. Such approval shall not serve in any way to relieve the Contractor of complete responsibility for the adequacy and safety of the referenced methods.

2.07 During any demolition procedure, the Contractor must provide an approved shield to prohibit all debris from falling onto MBTA Railroad Property. A protective fence must be erected at both ends of the project to prohibit trespassers from entering MBTA Railroad Property.

2.08 Cranes, shovels, or any other equipment shall be considered to be fouling the track when located in such position that failure of same with or without load, brings the equipment within the fouling limit. The Contractor's employees and equipment will not be permitted to work near overhead wires or apparatus.

2.09 The Contractor shall conduct his work and handle his equipment and materials so that no part of any equipment should foul an operated track or wire line without the written permission of the Railroad Company(s). When it becomes necessary for the Contractor to foul any track, he must give the Railroad Company(s) written notice of his intentions twenty-one (21) days in advance, so that if approved, arrangements may be made for proper protection of the Railroad Company(s).

2.10 The Contractor's equipment shall not be placed or put into operation adjacent to tracks without first obtaining permission from the Railroad Company(s). Under no circumstances shall any equipment or materials be placed or stored within fifteen

(15) feet from the centerline of the closest track.

2.11 Materials and equipment belonging to the Contractor shall not be stored on MBTA Railroad Property without first having obtained permission from the Railroad Company(s), and such permission will be on the condition that the MBTA and/or Railroad Company(s) will not be liable for damage to such materials and equipment from any cause. The Contractor shall keep the tracks adjacent to the site clear of all refuse and debris that may accumulate from construction operations, and shall leave the MBTA Railroad Property in the condition existing before construction commencement. Equipment repair, refueling or extended storage is prohibited on MBTA Railroad Property.

2.12 The Contractor shall consult the Railroad Company(s) in order to determine the type of protection required to insure safety and continuity of railroad operations. The railroad field engineer may assign track foremen, flagmen, signalmen or other employees deemed necessary for protective services by the Railroad Company(s), to insure the safety of trains and MBTA Railroad Property. The cost of same shall be paid directly by the contracting party with an advance deposit to the Railroad Company(s), unless otherwise approved.

2.13 The provision of such protective services, and other precautionary measures, shall not relieve the Contractor from liability for the cost of any and all damages caused by his operations.

2.14 The Railroad Company(s) will require protection during all periods when the Contractor is working on, over, under, within or adjacent to MBTA Railroad Property or as may be deemed necessary. When protection is required, the Contractor shall make the request in writing to the Railroad Company(s) at least twenty-one (21) days before such protection is required.

2.15 The Contractor shall not bill the Railroad Company(s) or MBTA for any work which he may perform, unless the Railroad Company(s) or MBTA authorizes the said work in writing. This work must be to the benefit of the MBTA or Railroad Company(s).

2.16 The Contractor, subcontractor and respective employees who will come within the limits of the MBTA Railroad Property, must first attend the Railroad Company(s) Safety Orientation Class. They are required to comply with the Railroad Company(s) Safety Requirements throughout the entire construction period. All costs associated

(scheduling 617-629-5541)

with compliance of the Railroad Company(s) Safety Requirements will be at the sole expense of the Contractor and subcontractors.

N/A as of 3/97

A. ~~The Contractor for the project must appoint a qualified person who will be designated as a Safety Representative. He must be approved by the Railroad Company(s) Safety Representative. The Contractor's designee will be responsible to give Safety Orientation to the Contractor's/subcontractor's employees who will come onto the MBTA's Railroad Property for short periods of time after the initial Safety Orientation Class has been given by the Railroad Company(s). The Contractor's designee will keep the Railroad Company(s) Safety Representative informed of the temporary employees who received Safety Orientation. The Railroad Company(s) Safety Orientation Class will be repeated when employee turnover or groups of Contractor's and subcontractor's employees are such that another Railroad Company(s) Safety Orientation Class is justified.~~

B. Contractors will follow established safety procedures and remain ~~15~~ 25 feet or more from the centerline of the closest track. When it becomes necessary for Contractors to encroach on this ~~15~~ 25 foot limitation, the proper fouling procedures will be arranged with the Railroad Company(s).

C. Contractors will establish the ~~15~~ 25 foot foul line by installing stakes and taping off the area prior to beginning work.

2.17 Upon completion of the work, the Contractor shall remove from the MBTA Railroad Property, all machinery, equipment, surplus materials, falsework, rubbish, temporary buildings and other property of the Contractor, or any subcontractor, and shall leave MBTA Railroad Property in a condition satisfactory to the MBTA and Railroad Company(s). Failure to comply will result in Railroad Company(s) forces restoring MBTA Railroad Property at the Contractor's expense.

2.18 The Contractor will pay the Railroad Company(s) directly, for all protective services unless otherwise approved. The services are performed to insure safe operation of trains when construction work would, in the Railroad Company(s) opinion, be a hazard.

SECTION 3. DEFINITION OF HAZARD

3.01 Protection Services will be required whenever the Contractor is performing work on, over, under, within or adjacent to MBTA Railroad Property. This will include

excavating, sheeting, shoring, erection, removal of forms, handling material, using equipment which by swinging or by failure could foul the track, and when any other type of work being performed, in the opinion of the Railroad Company(s), requires such service.

3.02 Railroad operations will be considered subject to hazard when explosives are used in the vicinity of MBTA Railroad Property during the driving or pulling of sheeting for footings adjacent to a track, when erecting structural steel across or adjacent to a track, when operations involve swinging booms or chutes that could in any way come closer than ~~15~~ 25 feet to the center line of a track or wire line. None of these or similar operations shall be carried on without Railroad Company(s) protective services personnel on site.

3.03 A signal line or communication line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any wire or cable. An electrical supply line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any wire of the line.

3.04 As excavation approaches pipes, conduits, or other underground structures on or adjacent to MBTA Railroad Property, digging by machinery shall be discontinued and the excavation shall continue by means of hand tools. All existing pipes, poles, wires, fences, property line markers, and other structures, which the MBTA and/or Railroad Company(s) decides must be preserved in place, shall be carefully protected from damage by the Contractor or its Owner. Should such items be damaged, they shall be restored by the Railroad Company(s), at the Owner's or Contractor's sole expense to the original condition prior to construction commencement. If any excavation is taken beyond the work limit indicated on the approved plans or prescribed herein, the Owner or its Contractor shall backfill and compact to the satisfaction of the Railroad Company(s) at his own expense.

SECTION 4. BACKFILL

4.01 Backfilling

A. All backfill material adjacent to any Railroad Company(s) facility shall be approved by the Railroad Company(s). Backfill material shall be free from hard lumps and clods larger than 3 inches in diameter, and free from large rocks or stumps. Uniformly fine material shall be placed next to any pipe liable to dent or break.

B. All backfill material shall be compacted at near optimum moisture content, in layers not exceeding 6 inches in compacted thickness by pneumatic tampers, vibrator compactors, or other approved means to the base of the railroad subgrade. Material shall be compacted to not less than 95 percent of AASHTO T 99, Method C. The Contractor will be required to supply to the job site, ballast stone (AREA #4) to be installed by the Railroad Company(s).

4.02 Certification

The Owner or its Contractor shall provide testing, through the use of a testing lab or Professional Engineer, to insure that the inplace density of the backfill meets or exceeds the requirements of Section 4.01(B). Written certification of the tests shall be given to the Railroad Company(s) immediately upon completion of the test.

4.03 Alternate

In the case of an open cut crossing of the MBTA Railroad Property, the Owner or its Contractor may backfill with concrete having a three-day compressive strength of 1000 psi to the base of the track subgrade. This may be used in lieu of providing the certification of proper compaction when using gravel backfill. The Owner or its Contractor will be required to supply to the job site, ballast stone (AREA #4) to be installed by the Railroad Company(s).

SECTION 5. CLEARANCES

5.01 Staging, falsework, or forms shall at all times be maintained with a minimum vertical clearance of 22'6" above top of the high rail and a minimum horizontal clearance of 15' from the center line of track.

SECTION 6. PROTECTION SERVICES

6.01 The MBTA shall require railroad inspection and may require railroad flagging. Prior to start of any work on MBTA Railroad Property, the Owner or its Contractor shall submit a deposit in the amount required by the Railroad Company(s). If Railroad Company(s) expenses are greater than the amount of deposit, the Owner or its Contractor shall reimburse the Railroad Company(s) for the balance when billed, and, if the Railroad Company(s) expenses are less than the amount of deposit, the

Railroad Company(s) will refund the balance to the Owner or its Contractor. The Railroad Company(s) reserves the right to request additional deposits as project work progresses.

6.02 If the MBTA or Railroad Company(s) determines that flagmen are necessary, the number required shall be on duty at the site during the hours of hazard described under Section 3. No work shall be performed if flagmen are required but are not on duty.

6.03 It shall be the responsibility of the Owner or its Contractor to keep the MBTA and Railroad Company(s) informed at all times when the Owner or its Contractor shall be working on, over, under, within or adjacent to MBTA Railroad Property and creating the hazards described under Section 3. Failure of the Owner or its Contractor to give the MBTA and Railroad Company(s) suitable advance notice of hazardous operation shall result in the shut down of the work by the Railroad Company(s), until such time as sufficient number of flagmen are on duty at the site. If this becomes a repeat occurrence, the Contractor will be removed from the project.

6.04 The Railroad Company(s) will make its best effort to provide protective services personnel. Should the situation arise where such personnel are not available, Contractor operations must cease. The Railroad Company(s) is not liable for any monetary claims incurred during the absence of protective services personnel.

SECTION 7. INSPECTION

7.01 If deemed necessary by the Chief Engineering Officer of the MBTA, the MBTA will furnish and assign an engineer(s) for inspection and the Railroad Company(s) will furnish an appropriate inspector for general inspection purposes or for general protection of MBTA Railroad Property and operations during construction. All protection services will be at the expense of the Owner or its Contractor.

SECTION 8. EXTRA-CONTRACT SERVICES

8.01 Temporary and permanent changes of tracks and all railroad utilities made necessary by the work of the Contractor, will be made by the MBTA or Railroad Company(s)

at the expense of the Owner or its Contractor.

8.02 All other changes made or services furnished by the Railroad Company(s), at the request of the Owner or its Contractor will be at the Owner's or its Contractor's expense.

MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY

RAILROAD OPERATIONS DIRECTORATE

III

INSURANCE SPECIFICATIONS

MAY 1994

III

February 2004 Revision

The insurance outlined in these Specifications is required of the Owner or its Contractor, and will be provided by or in behalf of all subcontractors performing any portion of the work. The Owner or its Contractor will be responsible for any modifications, deviations or omissions of the required insurance as it applies to subcontractors.

All insurance policies, unless otherwise specified under Railroad Protective Liability Insurance, are to be written either on an occurrence basis or, if a claims-made form, applicable renewals must have a date retroactive to the construction start date and will be maintained in force for one year following the acceptance of the work by the MBTA or its duly authorized representative.

With the exception of Railroad Protective Liability Insurance, all insurance policies must name the MBTA as an additional insured as its interest appears and waive any rights of subrogation against the MBTA.

Certificates of Insurance evidencing (1) either the claims-made or occurrence form coverage, (2) work description/location, (3) Owner or Contractor's corporate name, and (4) individual, company, government agency or municipality for which the work is being performed, must be furnished to and approved by TRA and the Railroad Company(s) prior to work commencement. The Certificate must provide that the insured will give Notice of Accident and Notice of Claim to the insurance company as soon as practicable after receiving such notice.

Original Insurance Binders reflecting Railroad Protective Insurance must be furnished to and approved by TRA and the appropriate Railroad Company(s) prior to work commencement.

Massachusetts Highway Department ('MHD') Contractors performing bridge rehabilitations on, over and adjacent to Railroad Property must furnish Insurance Certificates and Binders to the MBTA, c/o Railroad Operations Department, 32 Cobble Hill Road, Somerville, MA 02143 and the appropriate Railroad Company(s) prior to work commencement.

All policies must contain a minimum thirty (30) day written notice of cancellation clause, and provide that the Insurance Company will notify the Owner, Contractor, MBTA, TRA and Railroad Company(s), via registered mail, of any cancellation, change or expiration of the policy.

The Owner or Contractor will indemnify, defend and save harmless the MBTA and the appropriate Railroad Company(s) from and against any and all liabilities, losses (including losses of revenue), claims, costs, damages and expenses (including reasonable attorney's fees and expenses) that may be asserted against or incurred by the MBTA and the Railroad Company(s) arising from or as a result of the Owner or Contractor's work, or its use of adjacent land. Said indemnification will include claims, whether covered by insurance or not, including, but not limited to Worker's Compensation and similar insurance.

The Owner or Contractor will maintain, during the life of the contract, from company(s) authorized to do business in the Commonwealth of Massachusetts and satisfactory to the MBTA:

A. **COMMERCIAL GENERAL LIABILITY INSURANCE** for personal injury, bodily injury and property damage in an amount not less than $1,000,000 per occurrence and $3,000,000 in the aggregate covering all work performed on, over or adjacent to MBTA Railroad Property (the "work"), including:

1. All operations;
2. Contractual liability;
3. Coverage for the so-called "X, C, U" hazards, i.e., collapse of building, blasting, and damage to underground property;
4. Asbestos abatement, when applicable.

B. **AUTOMOBILE LIABILITY INSURANCE**, including the use of all vehicles owned, non-owned, leased and hired, in an amount not less than $1,000,000 combined single limit covering all the work.

C. **WORKER'S COMPENSATION INSURANCE** including Employees Liability Insurance, as provided by Massachusetts General Laws, Chapter 152, as amended, covering all the work.

D. **UMBRELLA LIABILITY COVERAGE**, in an amount not less than $5,000,000 per occurrence covering all the work.

E. **HAZARDOUS MATERIALS INSURANCE** if the work involves hazardous materials, the following coverage is required:

1. **Pollution Liability Insurance** for sudden and gradual occurrences in an amount not less than $1,000,000 per occurrence and $5,000,000 in the aggregate arising out of the work, including but not limited to all hazardous materials identified in the contract.

2. When applicable, the Owner or Contractor will designate the disposal site and furnish a Certificate of Insurance from the Disposal Facility for Environmental Impairment Liability Insurance for (a) sudden and accidental occurrences in an amount not less than $3,000,000 per occurrence and $6,000,000 in the aggregate and (b) non-sudden occurrences in an amount not less than $5,000,000 per occurrence and $10,000,000 in the aggregate.

4. Certificates of Insurance will clearly state the hazardous materials exposure work being performed.

F. **RAILROAD PROTECTIVE LIABILITY INSURANCE** is specifically designed for insuring Railroads, and is purchased by the Owner or Contractor in the name of the MBTA and the Railroad Company(s). The Railroad Company(s) is the named insured on the policy. Railroad Protective Liability Insurance is required for any work performed within fifty (50) feet of the railroad property line; it is not a substitute for any types of insurance outlined in these Specifications. Required limits are:

Bodily Injury: not less than $2,000,000 for all damages arising out of bodily injuries to or death of one person, and subject to that limit for each person, a total limit of $6,000,000 for all damages arising out of bodily injury to or death of two or more persons in any one accident;

Property Damage: not less than $2,000,000 for all damages arising out of injury to or destruction of MBTA property in any one accident, and subject to that limit per accident, a total of $6,000,000 in the aggregate for all damages arising out of injury to or destruction of MBTA property.

Direct general questions regarding insurance coverages to MBTA's Risk Manager at (617) 222-3064 or TRA at (617)482-2525.

Direct questions regarding railroad protective insurance coverage for MHD bridge rehabilitation projects to MBTA Railroad Operations at (617)222-3448.

Direct questions regarding passenger train counts and train speeds to Railroad Operations' Transportation Division at (617)222-5879.

Direct questions regarding freight train counts and train speeds to the appropriate Railroad Company(s) contained in this Specification No. III.

PROOF OF INSURANCE
MAILING ADDRESSES :

MBTA	Risk Manager c/o Treasurer-Controller 10 Park Plaza Boston, MA 02116 (617)222-3064
MBTA (Relating to MHD Contracts)	Railroad Operations 32 Cobble Hill Road Somerville, MA 02143 (617)222-3448
Transit Realty Associates	Twenty Winthrop Square Boston, MA 02110 (617)482-2525
Massachusetts Bay Commuter Railroad Company	Sr. Project ~~Division~~ Engineer 32 Cobble Hill Road Somerville, MA 02143 (617)222-8430

National Railroad Passenger Corporation (Amtrak)	Boston Division Office Two South Station Boston, MA 02110 (401)727-7322	(Projects Over MBTA Shore Line/ a/k/a Attleboro Line)
	Project Director Maine Service 58 Fore Street Portland, ME 04101	(Projects Over MBTA Lines Used for Portland, Maine Service)
CSX Transportation, Inc.	500 Water Street Jacksonville, FL 32202	
Bay Colony Railroad Corporation	General Manager 4 Freight House Road East Wareham, MA 02571 (781)380-3556	
Guilford Transportation Industries Boston and Maine Corporation and Springfield Terminal Railway Company, their Successors, Affiliates and Assigns	Chief Engineer Iron Horse Park No. Billerica, MA 01862 (978)663-6973	
Providence and Worcester Railroad Company	P.O. Box 1188 Worcester, MA 01601	

Appendix L

UMass Lowell Aluminum Fence Specifications

SECTION 32 35 13

ALUMINUM FENCE
ALTERNATE NO. 2

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Exterior Aluminum Fence.

B. Alternate No. 1.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 321000 – BASES, BALLASTS AND PAVINGS for concrete bases for the Aluminum Fence.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and sizes, dimensions of individual components and profiles, and finishes for the aluminum fence.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members, connections and other components. Show panel sizes, base details, and attachment details.

C. Samples for Verification: Provide a finish sample of the specified color.

D. Warranty Document: Provide copy of manufacturer's standard warranty for materials, finish and workmanship.

1.4 PROJECT CONDITIONS

A. Field Location: Verification of dimensions and layout information for the aluminum fence as shown on the approved shop drawings.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing aluminum fences similar to those indicated in the specifications for a minimum of five (5) years.

B. Fence Installer: A firm experienced in installing aluminum fences similar to those indicated in the specifications for a minimum of five (5) years.

1.6 WARRANTY

A. Materials and Workmanship: Manufacturer shall warrant the original purchaser of the aluminum fence to be free from defects in materials and workmanship and all fabrications to be in conformance with standard aluminum fabrication industry's tolerances and standards. Manufacturer shall supply a written warranty in accordance with the specification requirements.

B. 20Year Finish Warranty: The manufacturer shall warrant that the specified polyester powder coat finish will not rust, peel or blister for a period of Twenty (20) years from the date of purchase. Damage from accident, improper transport, improper installation, normal finish wear, vandalism or abuse and certain addition items listed on warranty documents are not covered. Warranty is limited on a pro-rated value of the coating only, not to exceed the original cost of the coating. Manufacturer shall supply a written warranty in accordance with the specification requirements.

PART 2 - PRODUCTS

2.1 ALUMINUM FENCE

A. General: Provide four (4) foot high, commercial grade, heavy duty, extruded aluminum fence posts, horizontal rails and intermediate pickets.

2.2 MANUFACTURERS

A. Acceptable manufacturers subject to compliance with the specifications include;
   1. American Fence Factory
   2. Ametco Manufacturing Corporation

3. Jerith Manufacturing Co., Inc.

2.3 COMPONENTS

A. Posts: 2 ¼ inches x 2 ¼ inches square, by .125 inches thick, spaced approximately 5 feet on center.

B. Post Caps: Provide standard flat (slightly tapered) caps for each post.

C. Horizontal Rails: 2 inch wide by 1 ¼ inch, high channels or tubes, by .080 inch thick, top, bottom and top intermediate rails. Top intermediate rail shall be spaced approximately 4 ½ inches down from the top rail.

D. Vertical pickets or balustrades: 1 inch by 1 inch square tubes, with .062 thick walls, spaced approximately 4 ½ inches on center.

E. Fasteners: If required, shall be hardened 410 stainless steel colored to match fence color.

2.4 FINISH

A. Black PPG TGIC polyester powder coating application on exposed to view surfaces.

2.5 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines and terminal posts. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 ALUMINUM FENCE INSTALLATION

A. Install aluminum fence per manufacturer's standard written instructions.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
   2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect above ground portion of posts from concrete splatter.

D. Post Bracing and Intermediate Rails: Install aluminum fence maintaining plumb position and alignment.

3.4 FINAL CLEANING

A. Clean entire fence to remove any construction or weather related material so installation appears new for final inspection and approval.

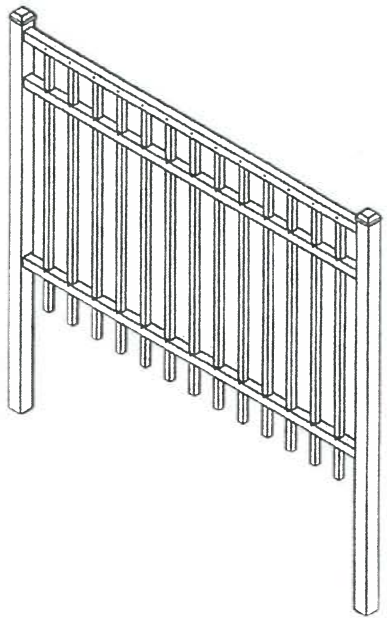
END OF SECTION 323513

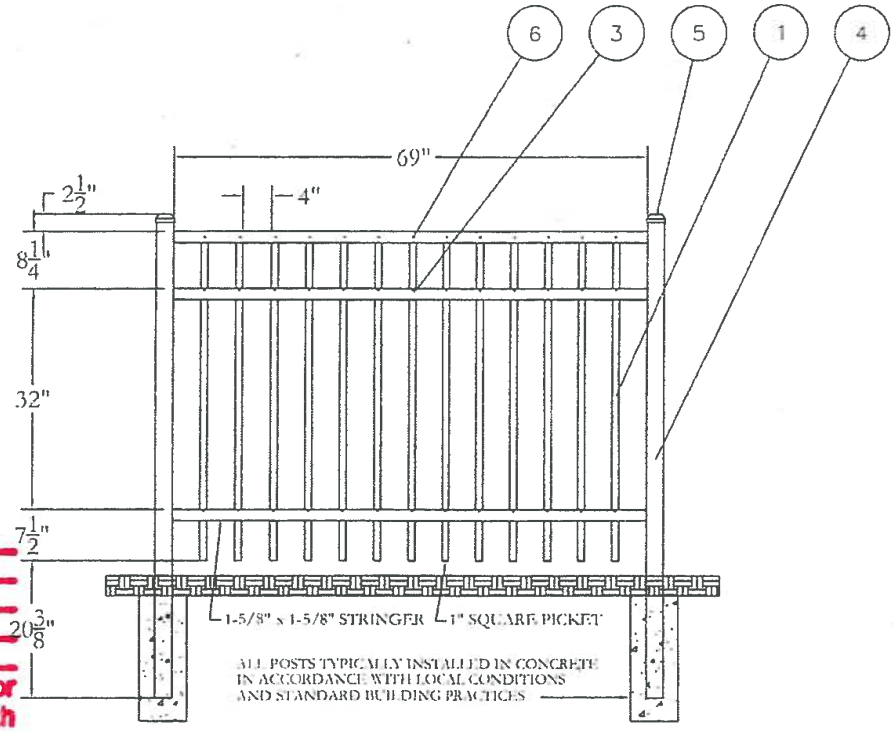
FENCE PARTS Per Section

Name	Qty	Item
1202-48 PICKET	13	1
70-1/2" - 13 HOLE IND. STRINGER	2	3
2-1/2" POST	2	4
2-1/2" ALUMINUM POST CAP	2	5
70-1/2" - 13 HOLE IND. HEADER	1	6

Finish - Black Polyester Powder Coated
# of Sections = 59

ZONE	REV	DESCRIPTION	DATE	APPROVED
-	NC	INITIAL RELEASE		





Jerith® Manufacturing Co., Inc.
Philadelphia, PA 19154
(800)344-2242

DRAWING:
INDUSTRIAL FENCE
STYLE #202 - 48" HEIGHT

SIZE	DWG NO.	REV
D	IN48U202SN	NC
SCALE	DATE 1-1-04	SHEET 1 OF 1

S&R Corporation

Job Name: Broadway & Pawtucket
Owner: UMASS Lowell
Contract No.: CL 14-HT-0039
Specification Section: 323513-01
Description: Aluminum Fence
These documents have been reviewed for verification of dimensions, compatibility with associated trades / equipment and general conformance with the Contract Documents.
Date: 11/
By: Richard L. Blume

Appendix M

MassDOT Permit to Access State Highway for Cleaning 42-inch Culvert

Jefferson Mill
670 N. Commercial Street, Suite 208
Manchester, New Hampshire 03101
tel: +1 603 222-8300
fax: +1 603 628-7675
cdmsmith.com

March 29, 2016

Paul Stedman
District Highway Director, District 4
Massachusetts Department of Transportation
519 Appleton Street
Arlington, MA 02476

Subject: Application for Permit to Access State Highway
Temporary Construction Access for Drainage Improvements
And Cleaning of Existing 42-inch Culvert
Lowell Connector – Exit 5A
Lowell, MA

Dear Mr. Stedman:

On behalf of the Lowell Regional Wastewater Utility (LRWWU), please find the attached Application for Permit to Access State Highway for the above mentioned project. LRWWU is requesting a Category 1, Minor Vehicle Access Permit, per the input received during a meeting with MassDOT on March 25, 2016 to discuss the project.

LRWWU is proposing to connect a new 60-inch drain pipe to an existing 42-inch culvert under the Lowell Connector so that the adjacent site can be developed by the City of Lowell for bus parking. The project work will also include cleaning the existing 42-inch culvert accessing both the inlet and outlet of the pipe. Temporary construction areas would be required to complete the project on MassDOT property; but these work areas would be outside of the state roadway. No modifications to traffic flow would be necessary for the work. Plans are attached to this application to show the work areas.

Access on the north side of the Lowell Connector would be from an adjacent property. For the culvert cleaning work, temporary work access is also necessary at the outlet end of the culvert on the south side of the Connector. Temporary access to the culvert outlet area would be required from the Exit 5A (north/east bound) ramp onto Thorndike Street (see attached drawing).

Temporary construction to access the existing 42-inch culvert is necessary to support an important city infrastructure improvement project: these improvements are part of a multi-phase city development program. The consolidation of existing drainage for the development of

massDOT
Massachusetts Department of Transportation
Highway Division

Application for Permit to Access State Highway

This Access Permit Application, including the attached Access Permit Submittal Checklist, must be completed in full by the Applicant. Instructions for this page are located on page 2. Descriptions of the two types of access permits and related categories are located on page 6. MassDOT will make the final determination regarding Access Permit Application type and category.

1. **Town/City:** Lowell - Lowell Regional Wastewater Utility (LRWWU)
2. **State Highway route number and/or name:** Lowell Connector - Exit 5A
3. **Locus/Property Address:** Land bounded by YMCA Dr (North), River Meadow Brook (South), Thorndike St (East), Howard St (West)
4. **Description of property and/or facility for which access is sought** (attach additional sheets if necessary):
   1. Access through abutting property to existing MassDOT 42-inch culvert inlet on north side embankment of Lowell Connector (outside roadway)
   2. Access along south side embankment of Lowell Connector to existing MassDOT 42-inch culvert outlet via end of Exit 5A ramp (outside roadway)
5. **Description of work to be performed within State Highway Layout** (attach additional sheets if necessary):
   1. Install a drainage connection (pipe and structure) to existing MassDOT 42-inch culvert inlet and cleaning of 42-inch culvert via inlet.
   2. Cleaning of existing MassDOT 42-inch culvert via outlet along side Lowell Connector Exit 5A. Select brush cutting for access.

   See attached design plans and cleaning figure

   ☐ **Telecommunications** (wireless or wireline) or **Renewable Energy** (Solar, Wind, etc) – Agreement Process and OREAD* coordination required. (*see pg 2 Instruction)
6. **Dig Safe number:**
7. **Applicant Information** [1] (See footnote below.)

   Name: Mark Young, LRWWU Executive Director
   Lowell Regional Wastewater Utility
   Mailing Address: 451 First Street Blvd (Route 110)
   Lowell, MA 01850
   Telephone: 978-674-4248
   Fax: 978-441-9579
   E-Mail: MYoung@lowellma.gove
   Signature: Mark A. Young
   Print Name: MARK A. YOUNG
   Date: 3-30-16

8. **Property Owner**

   Name
   Mailing address
   Telephone
   Fax
   E-Mail
   Signature
   Print Name
   Date

Return completed application, including Submittal Checklist, to the District Highway Director for your town/city. Refer to reverse side for appropriate address.

For office use only. Do not write below this line.

1. Application number:
2. Date received:
3. Fee amount (non-refundable) :
4. Completeness Pre-Review date:
5. MEPA required (yes or no):
   ENF-EOEEA Cert. #
   EIR-EOEEA Cert. #
   Other-EOEEA Cert. #
6. Section 61 Finding date:
7. Mass. Historic Action (yes or no):
8. Plans returned to DHD:
9. Permit Type/Category:
10. Application complete date:
11. Permit written date:
12. Permit issued date:
13. Permit denied:
14. Permit Recording date at Registry of Deeds

[1] If an agent is representing an Applicant, the application must include a notarized letter from the Applicant outlining the specified duties and responsibilities of the agent. Where work is proposed on a utility, the utility department must sign the application as the Applicant(s).

Instructions for Completing
Application for Permit to Access State Highway

General Instructions

MassDOT's Highway Division is granted authority to issue **State Highway Access** Permits by M.G.L. Chapter 81, Sec. 21. MassDOT adopted 720 CMR 13.00 under the authority of M.G.L. c. 81, § 21 and M.G.L. c.85 §2. 720 CMR 13.00 supersedes the Standard Operating Procedures for Review of State Highway Access Permits dated November 30, 1971, and board vote of September 17, 1991.

ACCESS is generally defined, but not limited to:
Any physical work performed within the State Highway Layout.

This Application governs issuance of the two types of access permit Applications, Non-Vehicular and Vehicular, which are issued under three categories:

Category I	Minor Vehicle Access Permits
Category II	Major Vehicular Access Permits
Category III	Complex Vehicular Access Permits

Please refer to the **MassDOT Highway Access Permit Submittal Checklist** for details regarding permit types and submittals required.

FEES:
A Check payable to **MassDOT** for the appropriate permit application fee must accompany the permit application. Fees are non-refundable.

Fee schedule for access and Utility Payments:

Residential Access Permits

5 Units or less	$25.00
From 6 to 49 Units	$100.00
Greater than 49 Units	$2000.00

Non-Residential Access Permits

Less than 25,000 square feet <25,000 Square feet	$500.00
From 25,000 to 300,000 square feet	$1000.00
From 300,000 to 750,000 square feet	$2000.00
Greater than 750,000 square feet	$3000.00

Non-Municipal Utility Permits not in conjunction With Access Permits:

Annual blanket utility permit	$500.00
Capital improvements to a utility	$500.00

Specific Instructions (print or type)

Line 1:
List name of municipality in which access is sought.
Line 2:
List name or number of State Highway Route(s) to which access is sought.
Line 3:
List Locus/Property address.
Line 4:
Describe property and/or facility. If access is sought under Category II above, briefly describe facility for which access is sought,

> ***Example 1:*** Private single family residence at 100 State Road. Approximate size of proposed building 2,500 s.f. Approximate lot size 0.75 acres.
>
> ***Example 2:*** 500,000 s.f. enclosed shopping mall adjacent to State Route I-290 and Route 20. Approx. lot size 67 acres.

Line 5:
Briefly describe the proposed work to be performed within the State Highway Layout.
*Office of Real Estate and Development (**OREAD**)

> ***Example 1:*** Remove 50 feet of existing granite curb on south side of highway in order to construct driveway access and modify the roadway geometry to accommodate left-hand turn.
>
> ***Example 2:*** Excavate 10 foot x 10 foot section of roadway at Station 100+00 in westbound lane in order to install water service to residence at 100 State Street.

Line 6:
A Dig Safe number must be provided if the work will commence within 30 days of the filing of the permit. **NOTE:** A Dig Safe number must be obtained by calling **1-888-DIG-SAFE** (1-888-344-7233). If construction within the State Highway Layout does not commence within the period allowed by Dig Safe, a new number must be obtained prior to beginning construction. (www.digsafe.com)

Line 7:
Individual or business making application must complete the required information, including application date and signature.

Line 8:
Complete this section only if the individual or business making application is other than the property owner of the land for which the permit applies.

Return completed application, submittal checklist and fee to appropriate District Office listed below. Please contact the Permit Engineer at this address if additional information is required.

District One
270 Main Street
Lenox, MA 01240
Tel. (413) 637-5700
Fax. (413) 637-0309

District Two
811 North King Street
Northampton, MA 01060
Tel. (413) 582-0599
Fax. (413) 582-0596

District Three
403 Belmont Street
Worcester, MA 01604
Tel. (508) 929-3800
Fax. (508) 799-9763

District Four
519 Appleton Street
Arlington, MA 02174
Tel. (781) 641-8300
Fax. (781) 646-5115

District Five
1000 County Street
Taunton, MA 02780
Tel. (508) 824-6633
Fax. (508) 880-6102

District Six
185 Kneeland Street
Boston, MA 02111
Tel. (857) 368-6100
Fax. (857) 368-0106

Highway Division Website:
www.massdot.state.ma.us/highway

Access Permit Submittal Checklist

GREY: DOT USE ONLY

This checklist provides the Applicant with a list of required submittals to obtain an Access Permit. However, additional submittals may be required to issue an Access Permit. All Applicants must fill out Part A and one additional part that correlates to the selected application type. To help identify the application type, please see the descriptions on page 6. Check each box that pertains to your application. MassDOT will make the final determination regarding Access Permit Application type and category.

PART A: ALL APPLICANTS MUST FILL OUT

1. APPLICATION TYPE – CHECK ONE

☐ **NON-VEHICULAR:**

- ☐ Non-Vehicular – Fill out Part B

☐ **VEHICULAR**

- ☐ **Category I** – Minor Vehicle Access Permits: Fill out Part C-1
- ☐ **Category II** – Major Vehicle Access Permits: Fill out Part C-1 and Part C-II
- ☐ **Category III** – Complex Vehicle Access Permits: Fill out Part C-1 and Part C-III

2. APPLICATION TYPE (Check all applicable boxes)

- ☐ Application Complete
- ☐ Permit corresponds to appropriate MassDOT District
- ☐ Non-refundable check or money order on correct amount payable to: **MassDOT**
- ☐ Evidence certifying property owner(s) consent
- ☐ Notarized Applicant Letter outlining agent's duties and responsibilities (if applicable)
- ☐ Utility department sign-off as the Applicant(s) (if applicable)

PART B: NON-VEHICULAR PERMITS

☐ **IF NO PHYSICAL MODIFICATION** ***to state highway layout*** *– i.e. parade, road race, traffic counts, etc.*

Required submittals:

- ☐ Map of route
- ☐ Traffic Management Plan (designed in accordance with the Road Flagger & Police Regulations: 701 CMR 7.00)
- ☐ Detour Plan(s) with municipal approval (if applicable)

☐ **IF DRAINAGE:**

- ☐ If requesting connection or discharge to any MassDOT drainage system, contact District Personnel for additional information regarding required submittals.

☐ **IF CONSTRUCTION, RELOCATION OR REPAIR OF UTILITIES:**

Required submittals:

- ☐ **EXISTING PROJECT:** reference(s) to the documents and plans already filed with MassDOT for the affected project
- ☐ **NEW PROJECT/UTILITY WORK:**

  Required submittals:

  - ☐ Engineered Plan(s) including method of crossing Highway
  - ☐ Traffic Management Plan (if applicable)
    (Designed in accordance with the Road Flagger & Police Regulations: 701 CMR 7.00)
  - ☐ Detour Plan(s) with municipal approval (if applicable)
  - ☐ Tree Cutting or Landscaping Plan (if applicable)
  - ☐ Vegetative Plan including plant species and maturity size (if applicable)
  - ☐ Blasting Plan (contact District Personnel for additional information)

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PART C-I: VEHICULAR PERMITS

CATEGORY I – Minor Vehicular Access Permits

Required submittals:

- ☐ ■ Engineering Plans
- ☐ ☐ ENF - (Environmental Notification Form) Certificate (if applicable)

IF RESIDENTIAL DRIVEWAY:

- ☐ ☐ Detailed plan/sketch showing the drive location in relation to the property lines, MassDOT baselines, distance from nearest mile marker, and an easily identifiable fixed object (distance from telephone poles, mail boxes, other drives, etc.).
- ☐ ☐ If severe topographic conditions exist, an engineered plan showing the driveway layout, profile and storm water management may be necessary to show that the edge of the proposed drive is protected during and after construction to prevent sediment and debris from entering upon the State Highway Layout (SHLO).

IF COMMERCIAL DRIVEWAY: (where no MEPA review is required)

Required submittals:

- ☐ ☐ Two (2) 40 scale plans that include:
  - ☐ A. Route Number, Road Name, Property Address
  - ☐ B. Property Corners and Bounds
  - ☐ C. Lot Line Dimensions, Bearings and Distances
  - ☐ D. State Highway Layout Lines (both sides) and Nearest Massachusetts Highway Bounds (if found).
  - ☐ E. State Highway Baseline and both edges of roadway including any sidewalks and type of edging, if any, and shoulder information (grass, gravel etc.).
  - ☐ F. Any existing drive to be altered or closed shall be indicated. Existing and proposed dimensions should be included for altered drives.
  - ☐ G. Information on all proposed drives including radii, widths, handicap ramps, etc. must be shown.
  - ☐ H. All existing and proposed buildings, utilities, trees, stonewalls, fences etc., should be labeled and shown in their correct location.
  - ☐ I. It is required that all stands, buildings, gasoline pumps and structures of any kind be placed at least 12 feet back from the State Highway Layout Line, since conducting of business within a State Highway Layout is forbidden.
  - ☐ J. Complete detail on drainage; all drives should be constructed on a downgrade from the edge of the highway surface or shoulder to the State Highway Layout Line.
  - ☐ K. Engineered plans will be required to show that storm flows are not directed into the SHLO, using contour lines, where applicant/owner property elevations are raised from the edge of the highway.
  - ☐ L. The plans should identify measures to protect the edge of the proposed drive during and after construction to prevent sediment and debris from entering upon the SHLO.

IF NEW STREET / SUBDIVISION ROAD:

Minor Intersection and Roadway Reconstruction (where no MEPA review is required)

Required submittals:

- ☐ ☐ All Commercial Driveway requirements (above) apply in addition to the following: Evidence of acceptance, including its line, grade and proposed drainage, by a local planning board, or other City of Town official with such authority.
- ☐ ☐ A street/road profile from its nearest high point and plan of drainage.

  Please be advised:

  - It will be required that all such future street approaches be constructed on a downgrade, where possible, from the edge of highway surface or shoulder to the State Highway Layout Line.
  - Common driveway criteria may apply and must be shown on plans as mentioned above.

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PART C-II: VEHICULAR PERMITS

CATEGORY II – Major Vehicular Access Permits

Required submittals:

☐ ☐ Engineering Plans based on the standards in the Manual On Uniform Traffic Control Devices (MUTCD), MassDOT's Project Development & Design Guide or its successor, MassDOT's Standard Specifications for Highway and Bridges, and any current technical policies or engineering directives Issued by MassDOT. All PS&E design submissions must be both in hard copy (one set) and electronic format. Electronic format includes PDF files transmitted to DHD or designee via USB Flash Drive, CD or posted to a FTP site.

☐ ☐ In cases where a proposed access is to be shared by multiple development sites, the Applicant(s) will provide evidence of the rights of access between the parties involved prior to the issuance of the Access Permit.

☐ ☐ MEPA Certificate

☐ ☐ Section 61 Finding

PART C-III: VEHICULAR PERMITS

CATEGORY III – Complex Vehicular Permits

Required submittals:

☐ ☐ Engineering Plans based on the standards in the Manual On Uniform Traffic Control Devices (MUTCD), MassDOT's Project Development & Design Guide or its successor, MassDOT's Standard Specifications for Highway and Bridges, and any current technical policies or engineering directives Issued by MassDOT. All PS&E design submissions must be both in hard copy (one set) and electronic format. Electronic format includes PDF files transmitted to DHD or designee via USB Flash Drive, CD or posted to a FTP site.

☐ ☐ In cases where a proposed access is to be shared by multiple development sites, the Applicant(s) will provide evidence of the rights of access between the parties involved prior to the issuance of the Access Permit.

☐ ☐ MEPA Certificate

☐ ☐ Section 61 Finding

Recording of Access Permits

Applicants must record any Vehicular Access Permit and plans or any Non-Vehicular Access Permit and plans involving drainage at the appropriate Registry of Deeds. Any Permit issued by MassDOT that requires recording will not be effective until recorded at the appropriate Registry of Deeds and a notice of recording is submitted to the District Highway Director (DHD). Changes may require the re-recording of permits and related documents. In those cases, permits will not be effective until re-recorded at the Registry of Deeds and a notice of recording is submitted to the DHD.

THERE ARE TWO TYPES OF ACCESS PERMIT APPLICATIONS: VEHICULAR, ISSUED UNDER THREE CATEGORIES & NON-VEHICULAR:

1. VEHICULAR ACCESS PERMITS:

Category I – Minor Vehicular Access Permits:
Access Permits for Projects that require entry to the State Highway Layout (SHLO), require little to no non-signalized modifications, and do not significantly alter the operating characteristics of traffic. These Projects ordinarily do not exceed the Massachusetts Environmental Policy Act (MEPA) transportation thresholds beyond the filing of an Environmental Notification Form (ENF).

Category II - Major Vehicular Access Permits:
Access Permits for Projects that require significant non-signalized modifications that may alter the operating characteristics of traffic at residential or commercial driveway intersecting with the SHLO; that require significant non-signalized modifications that may alter the operating characteristics of traffic at or upon any other intersection or roadway under the jurisdiction of MassDOT; that require the installation of a new traffic signal at a residential or commercial driveway intersecting with the SHLO or at any other intersection or roadway under the jurisdiction of MassDOT; or that require modification of structures, equipment, or hardware at an existing traffic signal at a residential or commercial driveway and its intersection with the SHLO or at any other intersection or roadway under the jurisdiction of MassDOT.

Category III – Complex Vehicular Permits
Access Permits for Complex Projects requiring actions similar to major Projects, but which require a new or altered SHLO; that require significant non-signalized and/or signalized modification within the SHLO over an extended distance or at a number of intersections that significantly alters the operating characteristics of traffic along a corridor; or that require the construction of a new, or modifications to an existing, bridge. These Projects generally require MEPA review and may require Federal review.

2. NON-VEHICULAR ACCESS PERMITS:

Access Permits for Projects that require access to the SHLO that do not involve physical modifications such as a parade or road race; construction, relocation or repair of utilities within the SHLO; tree cutting or landscaping within the SHLO; the use of explosives to remove material from within 250 feet of the SHLO; or connection to or discharge to any MassDOT drainage system (in cases where it can be shown that no practical alternative exists).

CONDITIONS REQUIRING AN ACCESS PERMIT

Vehicular Access Permits are required for:

- New residential or commercial driveways or streets intersecting the SHLO; or,
- Physical modifications to existing residential or commercial driveways or streets at their intersection with the SHLO; or,
- Change in use of an existing residential or commercial driveway onto SHLO that results in a **Substantial Increase in or Impact on Traffic** (as defined below) over the current use; or
- Construction of new or change in use of existing, residential or commercial driveway from properties that abut the SHLO to serve a building or facility, or expansion of a building or facility, that generates a Substantial Increase in or Impact on Traffic.

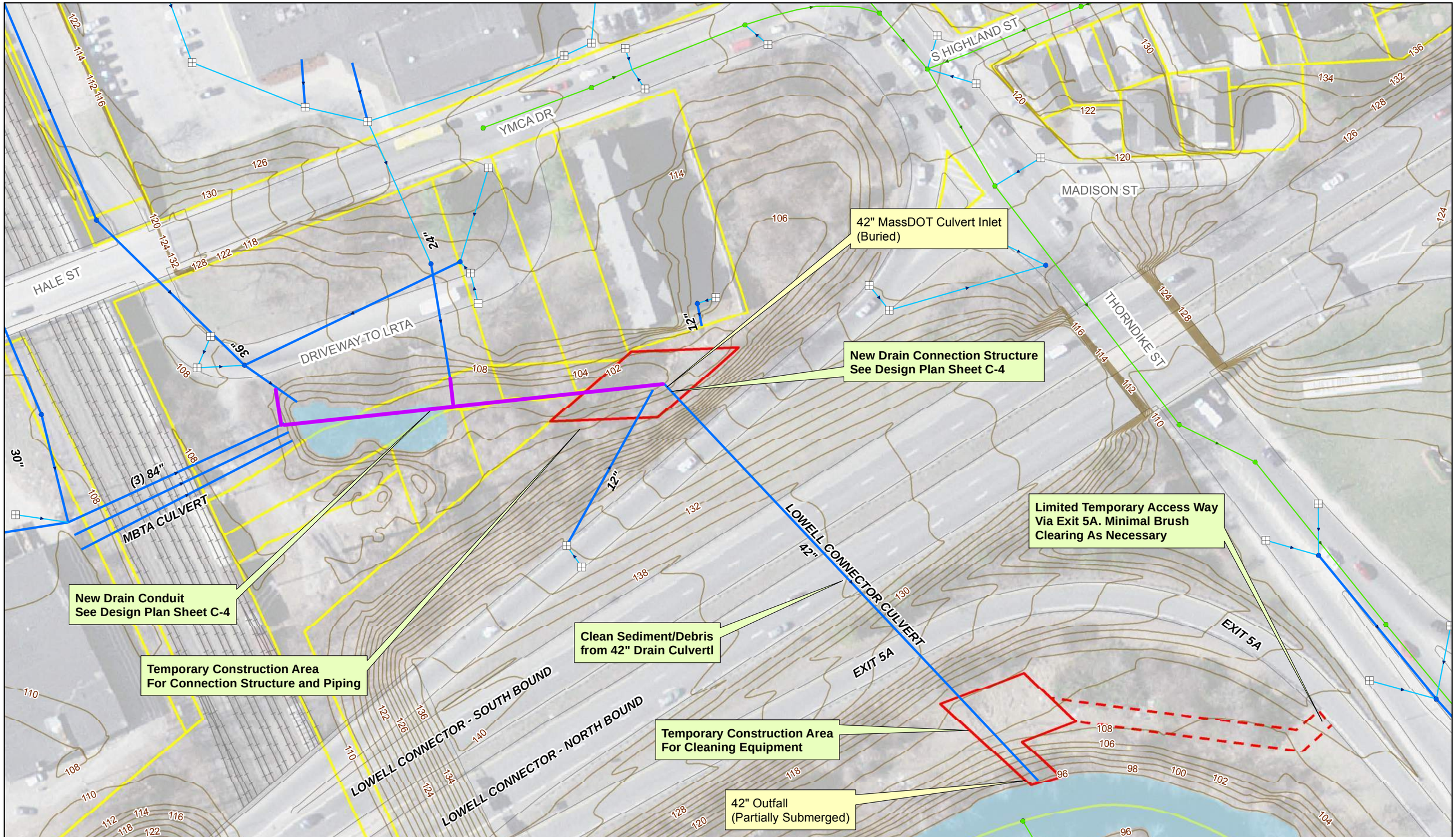
Substantial Increase in, or Impact on, Traffic as referenced above is defined as:
A Project that meets or exceeds any of the following thresholds:

(i) Generation of 2,000 or more new ADT on roadways providing access to a single location; or,
(ii) Generation of 1,000 or more new ADT on roadways providing access to a single location and construction of 150 or more new parking spaces at a single location; or,
(iii) Construction of 300 or more new parking spaces at a single location; or
(iv) Creation of a change in the type, pattern, or timing of traffic that is determined by MassDOT to generate a significant impact on traffic flow and safety.

Non-vehicular Access Permits are required for:

- Access to the SHLO for Projects that do not involve physical modifications; or
- Connection to or discharge to any MassDOT drainage system (in cases where it can be shown that no practical alternative exists); or
- Construction, relocation or repair of utilities within the SHLO; or
- Tree cutting or landscaping within the SHLO; or
- The use of explosives to remove material from within 250 feet of the SHLO.

In cases where a particular Project or activity may seek both vehicular and non-vehicular access, separate and distinct Permit Applications must be filed.



CDM Smith

Legend

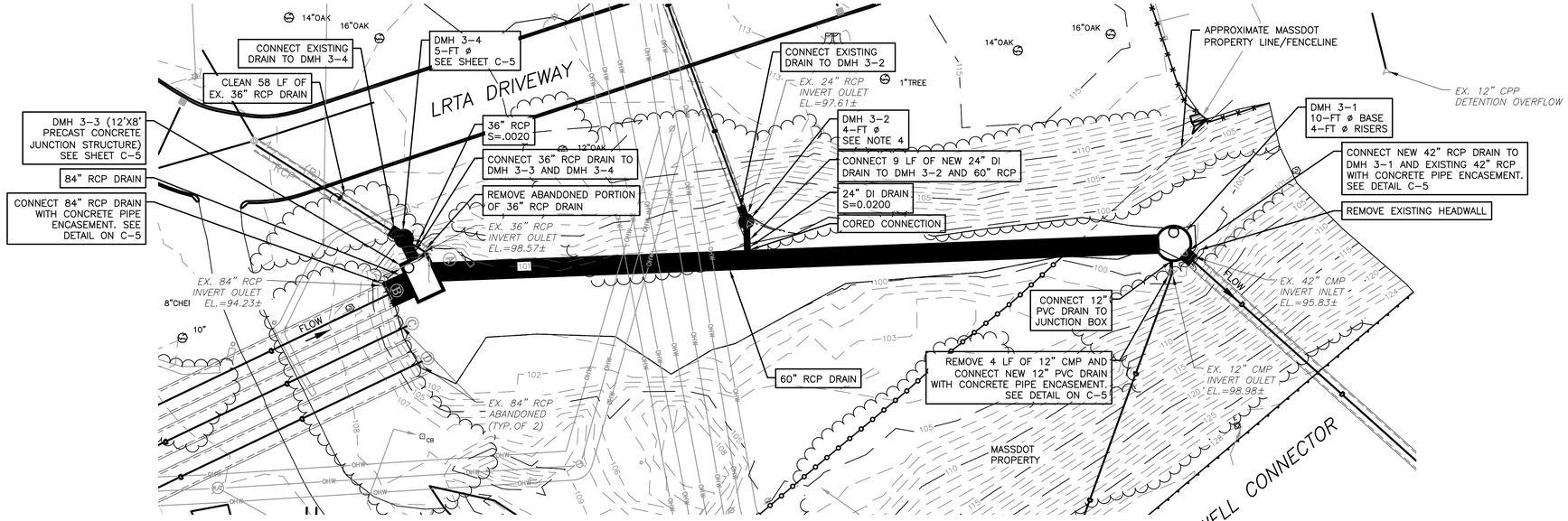
- Existing Drain
- Existing Sewer
- Existing Catch Basin
- Property Parcel
- GIS Contour
- New Drain Conduit
- Limited Temporary Access Way
- Temporary Construction Area (Approx)

0 50 100 Feet

N W E S

Lowell, Massachusetts

Permit to Access State Highway
Figure: General Construction Areas and Cleaning



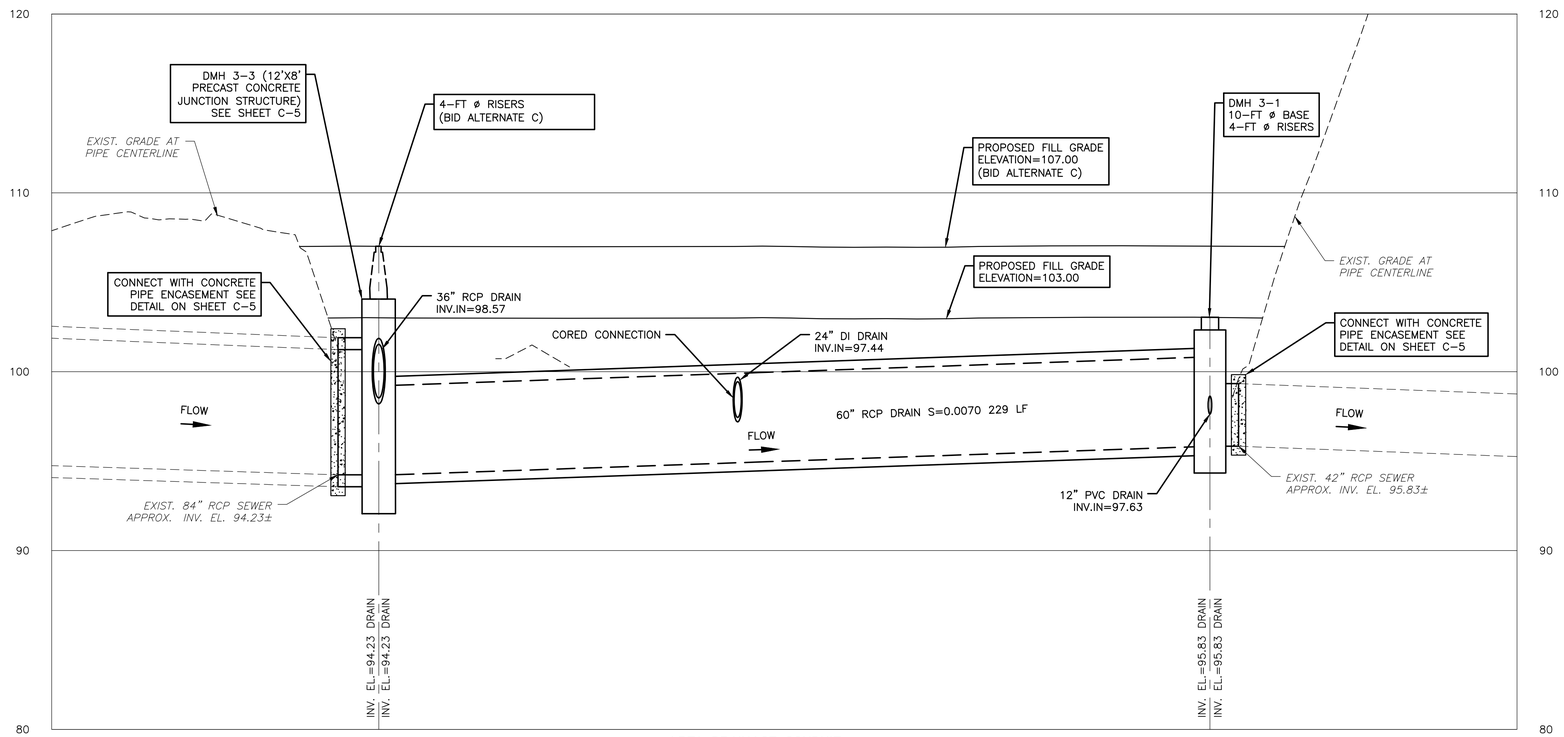
LRTA DRAINAGE CONDUIT

PLAN

1" = 20'

NOTES:

1. EXISTING INVERTS WERE SUBMERGED OR BURIED AT TIME OF SURVEY. ELEVATIONS AND RELATED PIPE INFORMATION IS APPROXIMATE. CONTRACTOR SHALL VERIFY ACTUAL INVERTS AND CONDITIONS TO COMPLETE WORK.
2. FOR LRTA DRAINAGE IMPROVEMENTS, MANHOLE FRAME AND COVERS SHALL BE BOLTED.
3. BACKFILL PIPES AND STRUCTURE BASES AS SHOWN IN GRADING PLAN. SEE SHEET C-5
4. VERTICAL FOOTAGE OF DMH 3-2 SHALL BE 10 VF WITH A FINAL GRADE ELEVATION OF 103 FEET. VERTICAL FOOTAGE OF DMH 3-2 UNDER BID ALTERNATE C SHALL BE 14 VF WITH A FINAL GRADE ELEVATION OF 107 FEET.
5. EXCESS FILL MATERIAL AND UNSUITABLE SOILS TO BE STOCKPILED AS DIRECTED BY OWNER.



LRTA DRAINAGE CONDUIT

PROFILE

HOR. 1"=20' – VERT. 1"=4'

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. LAVOIE
DRAWN BY: SLC/SDL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MARCH 2016

CDM Smith
670 N. Commercial St
Manchester, NH 03101
Tel: (603) 222-8300

LOWELL REGIONAL WASTEWATER UTILITY
LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS

LRTA DRAINAGE CULVERT

PROJECT NO. 0552-112344
FILE NAME: C004STPP.DWG
SHEET NO.
C-4
0552-XXXXX

50% SUBMITTAL - NOT FOR CONSTRUCTION

XREFs: [CDMS_2436, CWP000ST, CEP000ST] Images: [JAMES S. DRAKE MA PE]
Last saved by: LAVOIESD Time: 3/23/2015 9:28:39 AM
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REUSE OF DOCUMENTS: THESE DOCUMENTS AND DESIGNS PROVIDED BY PROFESSIONAL SERVICE, INCORPORATED HEREIN, ARE THE PROPERTY OF CDM SMITH AND ARE NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

Appendix N

2 copies of the Bid Form

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CITY OF LOWELL, MASSACHUSETTS
SEWER SEPARATION PROGRAM

MARGINAL SEWER RELIEF PIPE AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241/IFB 16-89

The undersigned declares that the only persons or parties interested in this Bid as principals are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that he has carefully examined all the Contract Documents as prepared by CDM Smith, 670 North Commercial Street, Suite 208, Manchester, NH 03101 and dated April 2016; that they have informed themselves fully in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid Form is a part.

The time period for holding bids, where Federal approval is not required is 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids and where Federal approval is required, the time period for holding bids is 30 days, Saturdays, Sundays and holidays excluded after Federal approval.

The Bid Security accompanying this Bid shall be in the amount of 5 percent of the Bid. The Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid.

If a Notice of Award accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents is delivered to the undersigned within thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. The premiums for all Bonds required shall be paid by CONTRACTOR and shall be included in the Contract Price. The undersigned further agrees that the Bid Security accompanying this Bid shall become the property of OWNER if the Bidder fails to execute the Agreement as stated above.

The undersigned hereby agrees that the Contract Time shall be 520 calendar days, commencing on the effective date of the Agreement. The undersigned hereby agrees that the Part A work on the Marginal Sewer Relief Pipe (including restoration of all areas in Part A, final paving on all city streets, UML South Campus Parking Lot, and the DPW yard) must be completed by August 19, 2016, in order for the OWNER to meet the requirements of the temporary construction easement granted by the private property owner and to restore full functional use of the DPW yard to the city by that date.

The undersigned hereby agrees that the OWNER intends to award the Bidder both Part A and Part B of this contract. The undersigned also acknowledges that the OWNER will execute one contract but issue separate a Notice to Proceed for each Part (Part A and Part B). A Notice to Proceed for Part B is subject to the OWNER's acquisition of property rights to complete the project work in Part B. The OWNER expects to obtain these rights within 120 days of the execution of this Agreement. The Bidder, by submission of its bid holds the OWNER harmless of any and all claims for financial compensation or restitution if Part B is not awarded and a Notice to Proceed is not issued within 120 days of the execution of the Agreement. This contract language will be in the Agreement between the OWNER and the Bidder.

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If the Undersigned fails to execute all work associated with Part A - Marginal Sewer Relief Pipe successfully, and to the satisfaction of the Owner and Engineer, by August 19, 2016, the Undersigned agrees to pay Owner liquidated damages of $2,500.00 per day for each day beyond date of August 19, 2016, or extension thereof that the Work remains incomplete.

The undersigned further agrees to pay OWNER, as liquidated damages, $1,500.00 per day for each calendar day beyond 520 Calendar Days or extension thereof that the Part B Work remains incomplete, in accordance with the terms of the Agreement.

The undersigned acknowledges receipt of addenda numbered:

Addendum No.	***Date***	***Acknowledgement***

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the Work in its entirety in the manner and under the conditions required at the prices listed as follows:

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.1a	525 lin. ft.	Furnish and install 24-inch RCP sewer pipe including earth excavation and backfill; All Depths		
		_____ per linear foot	$ _____	$ _____
A.2a		*These items not used in Part A*		
A.3a	80 lin. ft.	Furnish and install 8-inch restrained joint Class 52 cement-lined ductile iron water pipe including excavation and backfill; All Depths		
		_____ per linear foot	$ _____	$ _____
A.3b	280 pounds	Furnish and install cement lined ductile iron restrained joint fittings, couplings, and caps for 4-inch thru 8-inch diameter ductile iron pipe		
		_____ per pound	$ _____	$ _____
A.4a	25 vert. ft.	Furnish and install 4-foot diameter precast concrete sewer manholes		
		_____ per vertical foot	$ _____	$ _____
A.4b	30 vert. ft.	Furnish and install 5-foot diameter precast concrete sewer manholes		
		_____ per vertical foot	$ _____	$ _____
A.4c	L.S.	Furnish and install 6-foot diameter precast concrete doghouse sewer manhole		
		_____ lump sum		$ _____

Subtotal Bid Page 00300-3 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.5	30 cu. yds.	Test Pits per cubic yard	$	$
A.6a	375 cu. yds.	Rock and Boulder Excavation Fixed Bid per cubic yard	$ 110.00	$41,250.00
A.6b	375 cu. yds.	Rock and Boulder Excavation Additional Bid per cubic yard	$	$
A.7	25 cu. yds.	Earth excavation below normal grade per cubic yard	$	$
A.8a	1,670 cu. yds.	Bank-run gravel per cubic yard	$	$
A.8b	25 cu. yds.	Screened gravel per cubic yard	$	$
A.8c	30 cu. yds.	Crushed stone for utility crossings and miscellaneous purposes per cubic yard	$	$

Subtotal Bid Page 00300-4 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.8d	25 cu. yds.	Common fill _____ per cubic yard	$ _____	$ _____
A.8e	35 cu. yds.	Sand for utility crossings and and miscellaneous purposes _____ per cubic yard	$ _____	$ _____
A.9	L.S.	Dewatering and Drainage _____ lump sum		$ _____
A.10a	25 cu. yds.	Miscellaneous Concrete _____ per cubic yard	$ _____	$ _____
A.10b	25 cu. yds.	Controlled Density Fill _____ per cubic yard	$ _____	$ _____
A.11a	810 sq. yds.	Furnish and install temporary trench width bituminous pavement (Binder; 3.5-inch thick) _____ per square yard	$ _____	$ _____
A.11b	4,620 sq. yds.	Furnish and install final trench width bituminous pavement (2-inch Binder; 1.5-inch Top) _____ per square yard	$ _____	$ _____

Subtotal Bid Page 00300-5 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.11c	6,560 sq. yds.	Cold plane (grind) full width pavement on streets/parking lots _____ per square yard	$ _____	$ _____
A.11d	6,560 sq. yds.	Furnish and install final full-width 1.5-inch overlay pavement (Top Course 1.5-inch thick) _____ per square yard	$ _____	$ _____
A.12	20 hrs.	Provide industrial street sweeper and operator _____ per hour	$ _____	$ _____
A.13a	470 tons	Removal and disposal of contaminated soil to an in-state unlined landfill _____ per ton	$ _____	$ _____
A.13b	160 tons	Removal and disposal of contaminated soil to a lined landfill _____ per ton	$ _____	$ _____
A.13c	20 tons	Removal and disposal of contaminated soil as RCRA hazardous waste _____ per ton	$ _____	$ _____

Subtotal Bid Page 00300-6 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.13d	20 tons	Removal and disposal of contaminated soil as asbestos containing waste		
		_____ per ton	$ _____	$ _____
A.14	L.S.	Railroad Inspection Services/Flagman and Fees		
		Eighteen Thousand Dollars lump sum (FIXED)		$ 18,000.00
A.15	L.S.	Pipe jacking under railroad property		
		_____ lump sum		$ _____
A.16	L.S.	Furnish and install precast Marginal Sewer Relief Control Structure including all interior components and connections		
		_____ lump sum		$ _____
A.17 thur A.21		*These items not used in Part A*		
A.22	L.S.	Miscellaneous Work and Cleanup - Part A		
		_____ lump sum		$ _____
A.23	L.S.	Mobilization Part A- No greater than five percent of Total Bid Price for Part A excluding this item itself		
		_____ Lump Sum		$ _____

Subtotal Bid Page 00300-7 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER SEWER RELIEF

SUMMARY OF BID ITEMS

Subtotal of Bid Page 00300-7	$ _____
Subtotal of Bid Page 00300-6	$ _____
Subtotal of Bid Page 00300-5	$ _____
Subtotal of Bid Page 00300-4	$ _____
Subtotal of Bid Page 00300-3	$ _____
TOTAL PART A BID PRICE	$ _____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.1a		*This item not used in Part B*		
B.2a	225 lin. ft.	Furnish and install 60-inch Class IV reinforced concrete drain pipe including earth excavation and backfill; all depths		
		_____ per linear foot	$ _____	$ _____
B.3a thru B.3b		*These items not used in Part B*		
B.4a thru B.4c		*These items not used in Part B*		
B.5	30 cu. yds.	Test Pits		
		_____ per cubic yard *Transfer unit bid price from Item A.5*	$ _____	$ _____
B.6a	150 cu. yds.	Rock and Boulder Excavation Fixed Bid		
		_____ per cubic yard	$ 110.00	$ 16,500.00
B.6b	150 cu. yds.	Rock and Boulder Excavation Additional Bid		
		_____ per cubic yard *Transfer unit bid price from Item A.6b*	$ _____	$ _____
B.7	225 cu. yds.	Earth excavation below normal grade		
		_____ per cubic yard *Transfer unit bid price from Item A.7*	$ _____	$ _____

Subtotal Bid Page 00300-9 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.8a	5 cu. yds.	Bank-run gravel _____ per cubic yard *Transfer unit bid price from Item A.8a*	$ _____	$ _____
B.8b	5 cu. yds.	Screened gravel _____ per cubic yard *Transfer unit bid price from Item A.8b*	$ _____	$ _____
B.8c	5 cu. yds.	Crushed stone for utility crossings and miscellaneous purposes _____ per cubic yard *Transfer unit bid price from Item A.8c*	$ _____	$ _____
B.8d	1,025 cu. yds.	Common fill _____ per cubic yard *Transfer unit bid price from Item A.8d*	$ _____	$ _____
B.8e	5 cu. yds.	Sand for utility crossings and and miscellaneous purposes _____ per cubic yard *Transfer unit bid price from Item A.8e*	$ _____	$ _____
B.9	L.S.	Dewatering and Drainage _____ lump sum		$ _____
B.10a	5 cu. yds.	Miscellaneous Concrete _____ per cubic yard *Transfer unit bid price from Item A.10a*	$ _____	$ _____

Subtotal Bid Page 00300-10 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.10b	5 cu. yds.	Controlled Density Fill		
		_____ per cubic yard	$ _____	$ _____
		Transfer unit bid price from Item A.10b		
B.11a thru B.11b		*These items not used in Part B*		
B.11c	575 sq. yds.	Cold plane (grind) full width pavement on streets/parking lots		
		_____ per square yard	$ _____	$ _____
		Transfer unit bid price from Item A.11c		
B.11d	575 sq. yds.	Furnish and install final full-width 1.5-inch overlay pavement (Top Course 1.5-inch thick)		
		_____ per square yard	$ _____	$ _____
		Transfer unit bid price from Item A.11d		
B.12	10 hrs.	Provide industrial street sweeper and operator		
		_____ per hour	$ _____	$ _____
		Transfer unit bid price from Item A.12		
B.13a thru B.13d		*These items not used in Part B*		
B.14		*This item not used in Part B*		
B.15 thur B.16		*These items not used in Part B*		
B.17	L.S.	Cleaning of 42-inch diameter Lowell Connector Culvert including permitting		
		_____ lump sum		$ _____

Subtotal Bid Page 00300-11 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.18	L.S.	Complete subsurface boring program to characterize pipe bedding conditions _____ lump sum		$ _____
B.19	L.S.	Furnish and Install 10-foot diameter precast concrete drain manhole (DMH 4-1 on Sheet C-4) at 42-inch Lowell Connector culvert and 12-inch drain pipe connection, including earth excavation and backfill _____ lump sum		$ _____
B.20	L.S.	Furnish and Install 4-foot diameter precast concrete manhole (DMH 4-2 on Sheet C-4) and connecting pipe at 24-inch drain pipe connection, including earth excavation and backfill _____ lump sum		$ _____
B.21	L.S.	Furnish and Install 8-foot x 12-foot precast concrete drain junction struture (DMH 4-3 on Sheet C-4) at 84-inch pipe and 36-inch pipe connection and 5-foot diameter drain manhole (DMH 4-4), including earth excavation and backfill _____ lump sum		$ _____
B.22	L.S.	Miscellaneous Work and Cleanup - Part B _____ Lump Sum		$ _____

Subtotal Bid Page 00300-12 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.23	L.S.	Mobilization Part B- No greater than five percent of Total Bid Price for Part B excluding this item itself _____ lump sum		$ _____

Subtotal Bid Page 00300-13 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

SUMMARY OF PART B BID ITEMS

Subtotal of Bid Page 00300-13	$ _____
Subtotal of Bid Page 00300-12	$ _____
Subtotal of Bid Page 00300-11	$ _____
Subtotal of Bid Page 00300-10	$ _____
Subtotal of Bid Page 00300-9	$ _____
TOTAL PART B BID PRICE	$ _____

TOTAL CONTRACT BID PRICE

TOTAL PART A BID PRICE (Page 00300-8)	$ _____
TOTAL PART B BID PRICE (Page 00300-14)	$ _____
TOTAL CONTRACT BID PRICE (PARTS A+B)	$ _____

Bidders to be considered responsive shall submit bids on Part A and Part B listed in the Bid Form. The low bidder will be determined by comparison of the TOTAL BID PRICE (Part A plus Part B).

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

The bidding and award of this Contract will be in accordance with the provisions of M.G.L., Chapter 30, Sec. 39M.

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

City of Lowell Certificate of Compliance Form shall be completed by the contractor and submitted with the Bid Form as part of the bid documents.

The undersigned will engage the pipe jacking specialty contractor named below to complete the installation of a sewer pipe and casing under the railroad tracks as shown on the Drawings:
_____.
(pipe jacking contractor)

The undersigned agrees to submit to the Owner and Engineer the qualifications package of the pipe jacking contractor (as identified in Section 02340) within three days of the bid opening if the bid is one of the two low bidders. Failure to comply with the requirements of this paragraph may be deemed to render a proposal non-responsive.

Amounts shall be shown in both words and figures, where indicated. In case of discrepancy, the amount shown in words will govern.

The above prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance and incidentals required to complete the Work.

The names and residences of all persons and parties interested in the foregoing Bid as principals are as follows:

(Give first and last names in full. In the case of a corporation, see Article 8.3 of the Instructions to Bidders, in the case of a limited liability company (LLC), see Article 8.4 of the Instructions to Bidders, in the case of a partnership, see Article 8.5 of the Instructions to Bidders.)

_____

_____

_____

Pursuant to M.G.L. ch.62C, sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the

time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

The undersigned hereby certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder; and is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.

_____
Social Security Number or
Federal Identification Number

_____
Signature of Individual or
Corporate Name

By: _____
Corporate Officer (if applicable)

Notice of acceptance should be mailed, faxed, or delivered to the following:

_____
(Name)

By: _____
(Title)

_____
(Business Address)

_____
(City and State)

Date _____

Note: If the Bidder is a corporation, indicate State of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses, if different from business address.

CERTIFICATION OF COMPLIANCE
G.L.c.30, §39S
PUBLIC CONSTRUCTION MORE THAN $10,000.00

I certify under the pains and penalties of perjury that:

1. the Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

2. all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration ("OSHA") that is at least 10 hours in duration and 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

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 OSHA that is at least 10 hours in duration.

_____	_____
Signature of Individual or Corporate Name (Mandatory)	By: Corporate Officer (Mandatory, if applicable)

Approval of a contact or other agreement will not be granted unless this certification clause is signed by the applicant.

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CITY OF LOWELL, MASSACHUSETTS
SEWER SEPARATION PROGRAM

MARGINAL SEWER RELIEF PIPE AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241/IFB 16-89

The undersigned declares that the only persons or parties interested in this Bid as principals are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that he has carefully examined all the Contract Documents as prepared by CDM Smith, 670 North Commercial Street, Suite 208, Manchester, NH 03101 and dated April 2016; that they have informed themselves fully in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid Form is a part.

The time period for holding bids, where Federal approval is not required is 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids and where Federal approval is required, the time period for holding bids is 30 days, Saturdays, Sundays and holidays excluded after Federal approval.

The Bid Security accompanying this Bid shall be in the amount of 5 percent of the Bid. The Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid.

If a Notice of Award accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents is delivered to the undersigned within thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. The premiums for all Bonds required shall be paid by CONTRACTOR and shall be included in the Contract Price. The undersigned further agrees that the Bid Security accompanying this Bid shall become the property of OWNER if the Bidder fails to execute the Agreement as stated above.

The undersigned hereby agrees that the Contract Time shall be 520 calendar days, commencing on the effective date of the Agreement. The undersigned hereby agrees that the Part A work on the Marginal Sewer Relief Pipe (including restoration of all areas in Part A, final paving on all city streets, UML South Campus Parking Lot, and the DPW yard) must be completed by August 19, 2016, in order for the OWNER to meet the requirements of the temporary construction easement granted by the private property owner and to restore full functional use of the DPW yard to the city by that date.

The undersigned hereby agrees that the OWNER intends to award the Bidder both Part A and Part B of this contract. The undersigned also acknowledges that the OWNER will execute one contract but issue separate a Notice to Proceed for each Part (Part A and Part B). A Notice to Proceed for Part B is subject to the OWNER's acquisition of property rights to complete the project work in Part B. The OWNER expects to obtain these rights within 120 days of the execution of this Agreement. The Bidder, by submission of its bid holds the OWNER harmless of any and all claims for financial compensation or restitution if Part B is not awarded and a Notice to Proceed is not issued within 120 days of the execution of the Agreement. This contract language will be in the Agreement between the OWNER and the Bidder.

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If the Undersigned fails to execute all work associated with Part A - Marginal Sewer Relief Pipe successfully, and to the satisfaction of the Owner and Engineer, by August 19, 2016, the Undersigned agrees to pay Owner liquidated damages of $2,500.00 per day for each day beyond date of August 19, 2016, or extension thereof that the Work remains incomplete.

The undersigned further agrees to pay OWNER, as liquidated damages, $1,500.00 per day for each calendar day beyond 520 Calendar Days or extension thereof that the Part B Work remains incomplete, in accordance with the terms of the Agreement.

The undersigned acknowledges receipt of addenda numbered:

Addendum No.	***Date***	***Acknowledgement***

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the Work in its entirety in the manner and under the conditions required at the prices listed as follows:

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.1a	525 lin. ft.	Furnish and install 24-inch RCP sewer pipe including earth excavation and backfill; All Depths		
		_____ per linear foot	$ _____	$ _____
A.2a		*These items not used in Part A*		
A.3a	80 lin. ft.	Furnish and install 8-inch restrained joint Class 52 cement-lined ductile iron water pipe including excavation and backfill; All Depths		
		_____ per linear foot	$ _____	$ _____
A.3b	280 pounds	Furnish and install cement lined ductile iron restrained joint fittings, couplings, and caps for 4-inch thru 8-inch diameter ductile iron pipe		
		_____ per pound	$ _____	$ _____
A.4a	25 vert. ft.	Furnish and install 4-foot diameter precast concrete sewer manholes		
		_____ per vertical foot	$ _____	$ _____
A.4b	30 vert. ft.	Furnish and install 5-foot diameter precast concrete sewer manholes		
		_____ per vertical foot	$ _____	$ _____
A.4c	L.S.	Furnish and install 6-foot diameter precast concrete doghouse sewer manhole		
		_____ lump sum		$ _____

Subtotal Bid Page 00300-3 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.5	30 cu. yds.	Test Pits per cubic yard	$	$
A.6a	375 cu. yds.	Rock and Boulder Excavation Fixed Bid per cubic yard	$ 110.00	$41,250.00
A.6b	375 cu. yds.	Rock and Boulder Excavation Additional Bid per cubic yard	$	$
A.7	25 cu. yds.	Earth excavation below normal grade per cubic yard	$	$
A.8a	1,670 cu. yds.	Bank-run gravel per cubic yard	$	$
A.8b	25 cu. yds.	Screened gravel per cubic yard	$	$
A.8c	30 cu. yds.	Crushed stone for utility crossings and miscellaneous purposes per cubic yard	$	$

Subtotal Bid Page 00300-4 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.8d	25 cu. yds.	Common fill _____ per cubic yard	$ _____	$ _____
A.8e	35 cu. yds.	Sand for utility crossings and and miscellaneous purposes _____ per cubic yard	$ _____	$ _____
A.9	L.S.	Dewatering and Drainage _____ lump sum		$ _____
A.10a	25 cu. yds.	Miscellaneous Concrete _____ per cubic yard	$ _____	$ _____
A.10b	25 cu. yds.	Controlled Density Fill _____ per cubic yard	$ _____	$ _____
A.11a	810 sq. yds.	Furnish and install temporary trench width bituminous pavement (Binder; 3.5-inch thick) _____ per square yard	$ _____	$ _____
A.11b	4,620 sq. yds.	Furnish and install final trench width bituminous pavement (2-inch Binder; 1.5-inch Top) _____ per square yard	$ _____	$ _____

Subtotal Bid Page 00300-5 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.11c	6,560 sq. yds.	Cold plane (grind) full width pavement on streets/parking lots _____ per square yard	$ _____	$ _____
A.11d	6,560 sq. yds.	Furnish and install final full-width 1.5-inch overlay pavement (Top Course 1.5-inch thick) _____ per square yard	$ _____	$ _____
A.12	20 hrs.	Provide industrial street sweeper and operator _____ per hour	$ _____	$ _____
A.13a	470 tons	Removal and disposal of contaminated soil to an in-state unlined landfill _____ per ton	$ _____	$ _____
A.13b	160 tons	Removal and disposal of contaminated soil to a lined landfill _____ per ton	$ _____	$ _____
A.13c	20 tons	Removal and disposal of contaminated soil as RCRA hazardous waste _____ per ton	$ _____	$ _____

Subtotal Bid Page 00300-6 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER RELIEF PIPE

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
A.13d	20 tons	Removal and disposal of contaminated soil as asbestos containing waste		
		_____ per ton	$ _____	$ _____
A.14	L.S.	Railroad Inspection Services/Flagman and Fees		
		Eighteen Thousand Dollars lump sum (FIXED)		$ 18,000.00
A.15	L.S.	Pipe jacking under railroad property		
		_____ lump sum		$ _____
A.16	L.S.	Furnish and install precast Marginal Sewer Relief Control Structure including all interior components and connections		
		_____ lump sum		$ _____
A.17 thur A.21		*These items not used in Part A*		
A.22	L.S.	Miscellaneous Work and Cleanup - Part A		
		_____ lump sum		$ _____
A.23	L.S.	Mobilization Part A- No greater than five percent of Total Bid Price for Part A excluding this item itself		
		_____ Lump Sum		$ _____

Subtotal Bid Page 00300-7 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART A - MARGINAL SEWER SEWER RELIEF

SUMMARY OF BID ITEMS

Subtotal of Bid Page 00300-7	$ _____
Subtotal of Bid Page 00300-6	$ _____
Subtotal of Bid Page 00300-5	$ _____
Subtotal of Bid Page 00300-4	$ _____
Subtotal of Bid Page 00300-3	$ _____
TOTAL PART A BID PRICE	$ _____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.1a		*This item not used in Part B*		
B.2a	225 lin. ft.	Furnish and install 60-inch Class IV reinforced concrete drain pipe including earth excavation and backfill; all depths		
		_____ per linear foot	$ _____	$ _____
B.3a thru B.3b		*These items not used in Part B*		
B.4a thru B.4c		*These items not used in Part B*		
B.5	30 cu. yds.	Test Pits		
		_____ per cubic yard *Transfer unit bid price from Item A.5*	$ _____	$ _____
B.6a	150 cu. yds.	Rock and Boulder Excavation Fixed Bid		
		_____ per cubic yard	$ 110.00	$ 16,500.00
B.6b	150 cu. yds.	Rock and Boulder Excavation Additional Bid		
		_____ per cubic yard *Transfer unit bid price from Item A.6b*	$ _____	$ _____
B.7	225 cu. yds.	Earth excavation below normal grade		
		_____ per cubic yard *Transfer unit bid price from Item A.7*	$ _____	$ _____

Subtotal Bid Page 00300-9 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.8a	5 cu. yds.	Bank-run gravel _____ per cubic yard *Transfer unit bid price from Item A.8a*	$ _____	$ _____
B.8b	5 cu. yds.	Screened gravel _____ per cubic yard *Transfer unit bid price from Item A.8b*	$ _____	$ _____
B.8c	5 cu. yds.	Crushed stone for utility crossings and miscellaneous purposes _____ per cubic yard *Transfer unit bid price from Item A.8c*	$ _____	$ _____
B.8d	1,025 cu. yds.	Common fill _____ per cubic yard *Transfer unit bid price from Item A.8d*	$ _____	$ _____
B.8e	5 cu. yds.	Sand for utility crossings and and miscellaneous purposes _____ per cubic yard *Transfer unit bid price from Item A.8e*	$ _____	$ _____
B.9	L.S.	Dewatering and Drainage _____ lump sum		$ _____
B.10a	5 cu. yds.	Miscellaneous Concrete _____ per cubic yard *Transfer unit bid price from Item A.10a*	$ _____	$ _____

Subtotal Bid Page 00300-10 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.10b	5 cu. yds.	Controlled Density Fill		
		_____ per cubic yard	$ _____	$ _____
		Transfer unit bid price from Item A.10b		
B.11a thru B.11b		*These items not used in Part B*		
B.11c	575 sq. yds.	Cold plane (grind) full width pavement on streets/parking lots		
		_____ per square yard	$ _____	$ _____
		Transfer unit bid price from Item A.11c		
B.11d	575 sq. yds.	Furnish and install final full-width 1.5-inch overlay pavement (Top Course 1.5-inch thick)		
		_____ per square yard	$ _____	$ _____
		Transfer unit bid price from Item A.11d		
B.12	10 hrs.	Provide industrial street sweeper and operator		
		_____ per hour	$ _____	$ _____
		Transfer unit bid price from Item A.12		
B.13a thru B.13d		*These items not used in Part B*		
B.14		*This item not used in Part B*		
B.15 thur B.16		*These items not used in Part B*		
B.17	L.S.	Cleaning of 42-inch diameter Lowell Connector Culvert including permitting		
		_____ lump sum		$ _____

Subtotal Bid Page 00300-11 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.18	L.S.	Complete subsurface boring program to characterize pipe bedding conditions _____ lump sum		$ _____
B.19	L.S.	Furnish and Install 10-foot diameter precast concrete drain manhole (DMH 4-1 on Sheet C-4) at 42-inch Lowell Connector culvert and 12-inch drain pipe connection, including earth excavation and backfill _____ lump sum		$ _____
B.20	L.S.	Furnish and Install 4-foot diameter precast concrete manhole (DMH 4-2 on Sheet C-4) and connecting pipe at 24-inch drain pipe connection, including earth excavation and backfill _____ lump sum		$ _____
B.21	L.S.	Furnish and Install 8-foot x 12-foot precast concrete drain junction struture (DMH 4-3 on Sheet C-4) at 84-inch pipe and 36-inch pipe connection and 5-foot diameter drain manhole (DMH 4-4), including earth excavation and backfill _____ lump sum		$ _____
B.22	L.S.	Miscellaneous Work and Cleanup - Part B _____ Lump Sum		$ _____

Subtotal Bid Page 00300-12 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Brief Description of Items With Unit Bid Price in Words	Unit Bid in Figures	Amount in Figures
B.23	L.S.	Mobilization Part B- No greater than five percent of Total Bid Price for Part B excluding this item itself _____ lump sum		$ _____

Subtotal Bid Page 00300-13 **$**_____

CITY OF LOWELL, MASSACHUSETTS
MARGINAL SEWER RELIEF PIPE
AND LRTA DRAINAGE IMPROVEMENTS
CONTRACT 2-241 / IFB 16-89

BID FORM ITEMS

PART B - LRTA DRAINAGE IMPROVEMENTS

SUMMARY OF PART B BID ITEMS

Subtotal of Bid Page 00300-13	$ _____
Subtotal of Bid Page 00300-12	$ _____
Subtotal of Bid Page 00300-11	$ _____
Subtotal of Bid Page 00300-10	$ _____
Subtotal of Bid Page 00300-9	$ _____
TOTAL PART B BID PRICE	$ _____

TOTAL CONTRACT BID PRICE

TOTAL PART A BID PRICE (Page 00300-8)	$ _____
TOTAL PART B BID PRICE (Page 00300-14)	$ _____
TOTAL CONTRACT BID PRICE (PARTS A+B)	$ _____

Bidders to be considered responsive shall submit bids on Part A and Part B listed in the Bid Form. The low bidder will be determined by comparison of the TOTAL BID PRICE (Part A plus Part B).

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

The bidding and award of this Contract will be in accordance with the provisions of M.G.L., Chapter 30, Sec. 39M.

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

City of Lowell Certificate of Compliance Form shall be completed by the contractor and submitted with the Bid Form as part of the bid documents.

The undersigned will engage the pipe jacking specialty contractor named below to complete the installation of a sewer pipe and casing under the railroad tracks as shown on the Drawings:
_____.
(pipe jacking contractor)

The undersigned agrees to submit to the Owner and Engineer the qualifications package of the pipe jacking contractor (as identified in Section 02340) within three days of the bid opening if the bid is one of the two low bidders. Failure to comply with the requirements of this paragraph may be deemed to render a proposal non-responsive.

Amounts shall be shown in both words and figures, where indicated. In case of discrepancy, the amount shown in words will govern.

The above prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance and incidentals required to complete the Work.

The names and residences of all persons and parties interested in the foregoing Bid as principals are as follows:

(Give first and last names in full. In the case of a corporation, see Article 8.3 of the Instructions to Bidders, in the case of a limited liability company (LLC), see Article 8.4 of the Instructions to Bidders, in the case of a partnership, see Article 8.5 of the Instructions to Bidders.)

_____

_____

_____

Pursuant to M.G.L. ch.62C, sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the

time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

The undersigned hereby certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder; and is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.

_____
Social Security Number or
Federal Identification Number

_____
Signature of Individual or
Corporate Name

By: _____
Corporate Officer (if applicable)

Notice of acceptance should be mailed, faxed, or delivered to the following:

_____
(Name)

By: _____
(Title)

_____
(Business Address)

_____
(City and State)

Date _____

Note: If the Bidder is a corporation, indicate State of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses, if different from business address.

CERTIFICATION OF COMPLIANCE
G.L.c.30, §39S
PUBLIC CONSTRUCTION MORE THAN $10,000.00

I certify under the pains and penalties of perjury that:

1. the Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

2. all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration ("OSHA") that is at least 10 hours in duration and 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

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 OSHA that is at least 10 hours in duration.

_____	_____
Signature of Individual or Corporate Name (Mandatory)	By: Corporate Officer (Mandatory, if applicable)

Approval of a contact or other agreement will not be granted unless this certification clause is signed by the applicant.